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ANIMAL CURIOSITIES

THE CHIMPANZEE'S TOP NOTE.

ANIMAL CURIOSITIES

By

W. S. BERRIDGE, F.Z.S.

Author of "MARVELS OF THE ANIMAL WORLD," ETC.

With Numerous Illustrations from Photographs by the Author

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PREFACE

IT is hardly necessary to state that this book in no way purports to be a scientific treatise, the essays being written with a view to interest "the man in the street," and to bring before his notice some of the many remarkable creatures that populate the earth.

As an aid to the written word the service of the camera has been enlisted, and it is hoped that the illustrations accompanying the text will help the reader to visualize more readily some of the animal curiosities referred to in these pages.

W. S. B.

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CHAPTER I

THE VOICE OF ANIMALS

NOTWITHSTANDING that we commonly speak of the animals which populate the earth as "dumb creatures," yet, it is hardly necessary to state, the expression is by no means a correct one, for by far the greater number of them are able to denote their moods and feelings by means of vocal organs.

Although it is difficult for human beings to interpret the meaning of the various cries uttered by animals, nevertheless we are not justified in assuming that they are unintelligible to other creatures. Indeed, we have only to observe a mother cat and her kittens, or a hen and her brood of young ones, to recognize that the parents are capable of giving warnings and commands by the use of their voices.

With the exception of a few beasts such as the giraffes, the kangaroos, the armadillos, etc., the majority of mammals are endowed

with vocal powers, while the birds are especially gifted in such respect, many of them being experts at warbling and singing. Even among the reptiles we find that frogs, toads, certain snakes and lizards can produce vocal sounds; and quite a number of the fish, as well as many of the invertebrates, can give voice to various calls.

To the popular imagination the roar of a lion is probably the most imposing sound uttered by any wild beast, but we are told by travellers and explorers that the roar of a gorilla is of a far more formidable nature, Du Chailla describing it as the most singular and awful noise to be heard in the African forests, and one that "literally and closely resembles the roll of distant thunder."

The chimpanzee is another of the large apes that is able to produce a great volume of sound with its voice, and many of my readers may remember "Sally" who lived at the Zoological Gardens a number of years back, where she earned considerable fame by the intelligent manner in which she would perform tricks. One of her accomplishments was to "sing" at the command of her keeper, and although the noise she gave rise to when thus engaged was but a succession of yells and piercing cries that became louder and louder

THE HOWLER, THE NOISIEST OF ALL MONKEYS.

See p. 17.

A TUCO-TUCO—ITS VOICE RESEMBLES THE SOUND PRODUCED BY BEATING UPON AN ANVIL.

See p. 21.

THE NAKED-THROATED BELL-BIRD, REMARKABLE FOR ITS POWERFUL VOICE.

See p. 24.

THE AMERICAN BOWFIN, THAT UTTERS BELL-LIKE SOUNDS.

See p. 26.

THE BULL-SNAKE, THAT POSSESSES A POWERFUL VOICE.

See p. 29.

as she proceeded with her task, and could hardly be regarded by mere man as a musical performance of much merit, yet possibly, from a simian point of view, she was a Melba of her kind.

It is somewhat curious that many creatures are much more noisy at sunrise and sunset than they are during the rest of the day. The long-limbed apes known as the gibbons, for instance, greet the rising and the setting of the sun with a chorus of loud cries that can be heard for a distance of several miles, whereas during the daytime they go about their business in almost complete silence.

It remains with the South American howlers, however, to claim the distinction of being the noisiest of all monkeys; the males, in spite of their being little larger than a domestic cat, being endowed with a voice that is stated to be more powerful than that of any other living creature.

From all accounts it appears that the howlers indulge in their vocal performances at intervals throughout the evening and night, and when once their concert has started they may continue to make the forest resound with their cries for several hours on end.

Needless to say, the animals possess very efficient lungs, but this fact alone is not

sufficient to account for their ability to produce the large volume of sound for which they are famous, and we find that, in addition, they are endowed with a series of air sacs or resounding chambers that extend along the front and sides of the neck, and serve to intensify the notes they utter.

We are all of us familiar with those remarkable flying mammals called bats, but how many of us can state whether they ever give voice to any cry?

In all probability the majority of people are under the impression that they are quite dumb, but such is not the case, for even when on the wing they will emit cries which, however, are pitched in such a high key as to be quite inaudible to many human beings, although clearly heard by others whose power of hearing is more highly developed and attuned for the reception of such notes.

Among the dog family we find the voice of the African hunting-dog is very peculiar and consists of three distinct cries, each of which is uttered on special occasions. When one of the creatures catches sight of a strange object that it is unable to understand, it gives vent to a short bark, but, according to a well-known naturalist and explorer, during the night-time "... when large numbers of them are together,

and are excited by any particular occurrence, such as being barked at by domestic dogs," they produce a cry that "resembles a number of monkeys chattering together, or men conversing together when their teeth are chattering violently from cold."

Equally curious is the third sound the animal utters, this being said to resemble the second note of the well-known cuckoo's cry.

The most remarkable sound produced by any of the dog tribe, however, is that uttered by the spotted or laughing hyena, the beast, when in a state of excitement, giving forth a sequence of loud yells that have a weird resemblance to the boisterous laugh of a human being.

Every one who has visited Zoological Gardens will be familiar with the somewhat unpleasant and bark-like cry that the sea-lions indulge in when they desire to inform their keeper that the hour for feeding time is approaching. But the creatures are also able to give rise to a peculiar gurgling or rattling noise, accompanying the performance by shaking their heads violently from side to side.

The late Mr. Lydekker gives a very interesting description of the voice of the sea-bears or fur-seals, as those members of the sea-lion

family are called that possess a layer of soft under fur beneath their external and coarser pelage, forming, when dressed, the once fashionable commodity known as "seal skin."

He states that during the pairing season the males "give vent to four distinct cries, namely, a hoarse, resonant, long and loud roar; a low, gurgling growl; a kind of hissing, chuckling, piping whistle, which must be heard to be recognized; and a kind of spitting sound and action, which is the most characteristic of all. The females, on the other hand, have only a kind of bleating cry, used merely to attract the attention of the cubs; while the call of the latter is still more sheep-like."

The American tapir is another animal that produces a whistling sound, the note being very shrill but not very loud when one considers the size of the animal responsible for its production.

Passing to the elephant, we find that the creature is able to give voice to several distinct sounds, some of which are emitted through the agency of its trunk, while others are produced in its throat.

The most familiar of all is that known as "trumpeting." But the beast also utters a

peculiar, deep-toned and rumbling noise that arises from the throat, and when pleased it will emit a most absurdly soft, squeaking sound through the trunk that reminds one of the notes produced by the toy animals associated with the nursery of our youth.

The voice of cattle calls for no special comment except in the case of the yak which, instead of lowing and bellowing in the usual bovine manner, gives expression to a series of grunting calls, for which reason the animal is often spoken of as the grunting ox.

Of the many species of rodents, the house mouse frequently displays considerable ability as a vocalist, certain individuals, known as "singing mice," being able to modulate their voices to an extraordinary degree. It is reported that a specimen kept by a lady as a pet was able to run up an octave when singing, and that it would often finish its vocal performance with a trill. When thus engaged it would vibrate and inflate its throat in the manner of a bird in song, and usually assume an upright posture upon its hind feet.

Hailing from South America is a little rodent called by the name of the tuco-tuco. It is entirely subterranean in habits, and remarkable for its voice. Mr. Hudson writes

in reference to the species: ". . . all day long sounds its voice, resonant and low, like a succession of blows from a hammer; as if a company of gnomes were toiling far down underfoot, beating on their anvils, first with strong measured strokes, then with lighter and faster, and with a swing and rhythm as if the little men were beating in time to some rude chant unheard above the surface."

Also belonging to the rodent family is a small animal, about the size of a guinea-pig, variously known as the pica, tailless-hare, mouse-hare, calling-hare or piping-hare; the latter term being given to the creature because of the curious chirping or whistling sound it gives vent to when feeding. It is mainly nocturnal in habits, and during the daytime lies concealed within a burrow or else between the crevices of a rock.

Few people can claim a very intimate acquaintance with the whales and their kindred, therefore it is not surprising to note that the majority of human beings are under the impression that these aquatic mammals are unable to utter any cry. Such, however, is not the case, for certain whales are endowed with the power to produce vocal sounds, while the dolphin is able to emit a low murmuring noise.

It is also recorded that some porpoises, having ascended a river in Dorsetshire and finding their return barred by a fencing placed in the water, gave voice to the most distressing cries.

In our review of the birds we find among them so many experts in the art of singing and whistling that it would be rash to proclaim any given species as being the most highly gifted in such respect. There can be little doubt, however, that from a popular point of view the nightingale has earned more fame as a songster than any other bird on account of its wonderfully clear voice and remarkable habit of warbling during the night. But it must not be assumed that this feathered songster confines its vocal performances solely to the night season, for it sings with equal, if not greater, vigour and sweetness during the daytime, although, of course, at such a time its melody is liable to be rendered less distinct owing to the volume of sound produced by other birds singing in the vicinity at the same time.

Before proceeding further with our remarks upon the vocal power of birds, the writer feels it almost a duty to make a protest against the common custom of describing their songs by words, for unless one is already familiar with

the sounds produced by any given species, the practice is absolutely valueless.

Who would endeavour to teach the air of our National Anthem to anybody unacquainted with it by writing down the words of one of the verses?

Yet the usual bird-song formula of *tweet-tweet, jug-jug, pink-pink,* etc., is no more comprehensible, and conveys no idea as to the musical notes the words are supposed to portray, or the key in which they should be pitched.

Space does not permit of our mentioning more than a few of the more remarkable singing birds, but of these the bell-birds certainly claim special attention. Of the four different species, one of the best known is the naked-throated bell-bird, of which several examples have been exhibited at the London Zoological Gardens on various occasions, the first one arriving there in May, 1867.

A fully-grown male may be compared in size to an adult blackbird. The colour of its plumage is entirely white, except for a few tiny black feathers that sprout from the otherwise bare skin of the throat which, during the pairing season, is of a pale green tint, as also is the skin around the eyes.

The voice of the bell-bird is extremely loud

and penetrating, so much so, indeed, that it is by no means pleasant for a person to have to stand close to one of the songsters when it is indulging in its musical performance. Heard at a distance, however, its notes are very pleasing, resembling as they do the clear and metallic toned ringing of a bell, or the sound produced by a blacksmith striking a piece of metal upon an anvil.

The piping crows of Australia and Tasmania also possess remarkable vocal powers.

In the majority of cases their song is a beautiful whistle, while in captivity they will readily learn to pipe tunes, and even become proficient at talking.

A certain species, however, called by the Colonists by the name of "organ-bird," is peculiar in the fact that it utters notes resembling the noise produced by a hand-organ that has seen better days.

Quite a number of birds can be taught to talk and whistle, one of the best known being the grey parrot.

Cockatoos and macaws will also learn to imitate the human voice, and it is recorded that a green parakeet belonging to a soldier in India was able to speak words of three different languages, namely, English, Japanese and Hindustani.

Other birds that indulge in the practice of articulating words are the tui or parson bird of New Zealand, the Indian hill mynah, the raven, the jackdaw, the jay and the starling.

In regard to the latter, it is a common belief that the bird is unable to talk unless its tongue is slit at the top.

Such, however, is not the case, for no bird talks with the aid of that member, but produces the various sounds it utters entirely from the lower portion of its windpipe.

Among the fish there are a large number of different kinds that possess voices. The American bow-fin is an example that is able to produce bell-like notes, while the sapphire gurnard or tub-fish emits a grunting or crowing noise, for which reason it is frequently called the "sea-cock." Then, again, Sir J. Bowring tells us that a fish known as the dog's tongue (*Cynoglossus*), a kind of sole, about four inches long, that is in the habit of attaching itself to the bottom of boats, produces a sound like that of a Jew's harp struck slowly, though sometimes it increases in volume and resembles the full tone and sound of an organ.

Darwin, moreover, reports that a catfish, found in Rio Parana and called by the name

of Armado, gives rise to a grating sound, when it is caught by hook and line, that can be heard distinctly even when the fish is beneath water.

The horse mackerel or scad emits a noise that resembles the grunting of a hog, while the globe-fish, a remarkable species that has the power to inflate its body with air until it assumes the shape of a Rugby football, also produces a similar sound.

The sunfish, a large fish sometimes found in British waters, is said to utter a distinct groan when it is removed from its native element, and the carp and the barbel will croak when treated in a similar manner. The Jewfish, found in the Gulf of Mexico, is reported to emit a booming sound, and some of the blennies are able to utter a cry that has been likened unto a shriek.

Yet another vocal performer is the meagre which utters a humming sound, and when a number of the fish are found together the noise they produce is audible through a depth of over 120 feet of water.

Passing to the reptiles and batrachians, we find that certain species are endowed with vocal powers, while others are dumb.

Although many of the lizards can produce hissing sounds, and the geckos are capable of

emitting loud noises that are said to be caused by the creatures striking their tongues against the roof of their mouths, yet few of them have a voice proper. Those, however, that do possess one, give rise to sharp and clear cries somewhat resembling the chirping of a cricket.

The voices of frogs and toads are of a very varied nature, but most of them produce croaking sounds through the agency of vocal sacs which, in some instances, attain to a very large size when extended to their fullest extent. Indeed, so enormous is the inflated air pouch of the male European tree-frog that it almost equals the bulk of the creature's body, and when a number of these frogs are croaking in unison their voices can be heard for a distance of several miles.

The golden tree-frog of Australia is stated to utter a cry that resembles the sound produced by a stonemason wielding a mallet and chisel, while at other times it will emit a sound like that made by cattle bells.

According to Dr. von Ihering, the voice of another tree-frog from Tropical America sounds like a person rubbing his finger-nails over the teeth of a comb; while the South American dwarf toad, during the pairing season, gives

voice to call notes that commence with two clear and ringing notes that are followed by a somewhat protracted and descending trill; the whole performance reminding one of the song of a greenfinch.

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Very remarkable are the vocal powers of the ceratophrys, barking-frogs or horned-toads as they are variously called. One of the better-known species is the ornamented ceratophrys (*Ceratophrys ornata*) of Southern Brazil and the Argentine, which grows to a length of about eight inches. When irritated or frightened, it inflates its body to an enormous size and then utters the most peculiar cries that closely resemble the wailings of a human baby. At other times it will give rise to barking sounds, and also produce deep-toned and bell-like noises.

The common spade foot or toad-frog is also curious in the fact that it indulges in the habit of swelling out its body like a balloon and then gives voice to loud and shrill cries like those of a baby; while the Brazilian tree-frog (*Hyla faber*) utters a cry that may be compared to the sound produced by knocking a mallet against a copper plate.

One would hardly imagine that snakes were endowed with voices, but certain species, notably the bull, pine or Say's snake, and the

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Indian rat snake are able to produce a considerable volume of sound.

Indeed, so powerful is the voice of the former reptile that its bellowing notes can be heard for a distance of a hundred feet.

Of the many insect vocalists, the cicadas have earned considerable fame on account of their powerful voices. The song of the creatures was greatly appreciated by some of the ancient Greeks, and Virgil and other poets wrote verses in their honour.

Xenarchus, however, does not appear to have shared the general enthusiasm for their musical performance, for he refers to the fact that only the males possess sound-producing organs and writes: "Happy are the Cicada's lives, for they all have voiceless wives."

A more modern writer, Dr. Shaw, in his book, *Travels in Pennsylvania*, complains that: ". . . the cicada is perpetually stunning our ears with its most excessively shrill and ungrateful noise. It is, in this respect, the most troublesome and impertinent of insects, perching upon a twig, and squalling sometimes two or three hours without ceasing. . . ." Another writer refers to the penetrating nature of the insect's voice and states that were one of the creatures to attain to the size of a human being, and supposing its voice were increased

in ratio to its enlarged size, its cries could be heard half over the world.

A number of insects, such as the locusts and crickets, produce sounds by means of stridulating organs that work upon the principle of a bow and fiddle.

Although the "song" of these creatures is of a very high-pitched and penetrating nature, yet the Indians of the Amazon valley have for long made a practice of keeping the former in cages in order to listen to their chirping.

The Japanese also indulge in a similar practice in regard to crickets. These curious pets, known as Fuku-Moustu, or Happy Bell, are kept in small and exquisitely made wooden cages which are hung up in a room in the manner of a bird cage. As, however, the crickets only give full vent to their musical performance during the hours of darkness, it is difficult to understand how their vocal entertainment can be appreciated unless the listener be content to remain awake half the night.

Among the beetles, that known as the death-watch or death-tick, a species that plays such havoc by burrowing narrow galleries through the timber of houses or in old furniture, gives rise to a curious ticking sound by knocking its hard mandibles against the wooden walls

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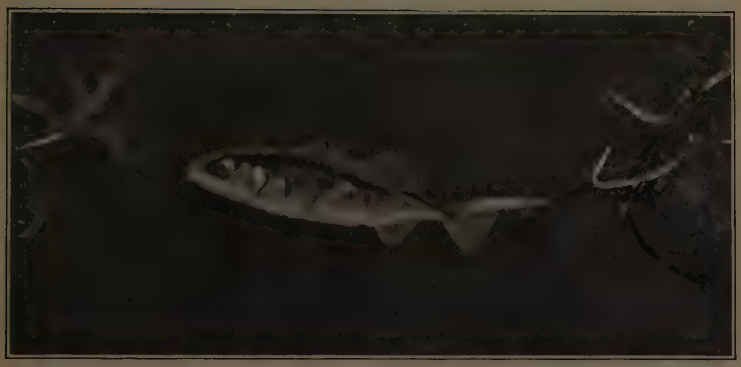
of its domain; while of the Lepidoptera, we have an example in the death's head moth that is gifted with the power of uttering a squeaking cry, both the caterpillar and the moth itself indulging in the practice.



THE THREE-SPINED STICKLEBACK MAKES A MUFF-SHAPED NEST.

See p. 33.

PARADISE FISH, THAT MAKES A NEST OF BUBBLES.

See p. 38.

A PIPE-FISH.

See p. 41.

A SEA-HORSE.
See p. 42.

THE CHAMELEON, FAMED FOR ITS COLOUR-CHANGING POWER.
See p. 67.

CHAPTER II

FISH AND THEIR NESTS

ALL fish, with the exception of a few species that are viviparous, lay eggs from which the young emerge; and although the majority of the parents pay little attention to the ova when once they have been deposited, yet, on the other hand, others build nests for their accommodation, and stand guard over them.

Amongst British fish there are several kinds that are in the habit of constructing nests, the most familiar being the sticklebacks, of which there are three species. Two of them dwell in fresh water, and one inhabits salt or brackish water; the three-spined and the ten-spined sticklebacks favouring the former habitat, and the fifteen-spined stickleback the latter.

The nest of the three-spined stickleback is composed of grass, fragments of floating straw, and fibrous pieces of aquatic plants. These are formed into a muff-shaped structure measuring

about an inch in diameter, and held together by a fluid secreted by the fish's kidneys. It is fashioned by the male with the aid of his mouth and snout, and rests upon the bed of a stream in shallow water. When all is ready, the female enters one end of the nest that has been left open by the male, and having deposited her eggs inside she makes an exit at the other end and passes out.

When once the ova are laid in the nest, the male stands guard over them and ensures that they receive a sufficient supply of oxygen for their needs by gently fanning his breast fins backwards and forwards, thereby causing a continual supply of fresh water to circulate around the home and its precious contents. After a period of about ten days, the young, which are very small and so transparent as to be scarcely visible to the human eye, hatch out.

The devoted father then becomes even more watchful than before, never leaving his charges night or day, and driving away all intruders. Only when the fry are sufficiently grown to be able to look after themselves does he relax his vigilance.

The habits of the ten-spined stickleback are very similar to those of the foregoing, except that its nest is placed amongst foliage and roots of

aquatic plants; but those of the marine fifteen-spined stickleback, or sea-adder, as it is sometimes called, are the most remarkable of all. The eggs are deposited by the female in the midst of some growing seaweed. The male then folds the branches around the ova, binding them up into an oval or pear-shaped mass by means of a gelatinous and somewhat elastic thread that he spins. This thread, which is no thicker than a strand of the finest silk, and quickly hardens when exposed to the action of the water, is woven in and out, and encircles the seaweed in all directions so that the eggs remain secure until the young are hatched; the father watching over them until that event takes place.

The goby is another fish found around our shores that is in the habit of providing a shelter or nest for the accommodation of its eggs. The male selects a cockle shell and, placing the convex side uppermost, proceeds to fix the lower edge to the sand by applying a secretion yielded from his skin that forms a cement. He then excavates a little tunnel leading beneath the shell, and renders the nest invisible to prying eyes by covering it over with a layer of sand. Within this novel home the female deposits her eggs, fixing them firmly to the interior of the shell. The male

then keeps a vigilant watch over them until the young ones emerge; the incubation period varying from six to nine days.

The three species of lampreys found in British waters, known respectively as the sea lamprey, the river lamprey or lampern, and the small lamprey, resort to the practice of excavating trenches or furrows in the soil of the river beds for the reception of their eggs. Should an individual come across a stone during the progress of its work, it lifts up the obstacle with the aid of its sucker-like mouth and places it to one side.

The spawning habits of the salmon are very similar to those of the lampreys inasmuch as the female makes a nest or "redd" in the form of a trench excavated in the bed of a river. There appears to be some difference of opinion, however, as to how the fish accomplishes this work, some authorities stating that she employs her tail in the making of the trench, while others are of the opinion that the structure is formed by the pressure and wriggling of the lower part of her body against the underlying soil. When once she has deposited her eggs in the redd she covers them up with fine gravel, and, after a period varying from one hundred and twenty to one hundred and forty days, according to the

temperature of the water, the salmon fry hatch out.

Few fish prove more devoted parents than the American bow-fin. At the approach of the spawning season the males and females pair off and resort to the shallow waters of their habitat for the purpose of preparing a nursery for their prospective family, a circular clearing being made amidst the rushes and reeds by breaking the stems asunder, or by biting through them with their sharp teeth. A shallow depression is then formed in the ground in the centre of the clearing, wherein the female deposits her eggs to the number of several thousand. The ova, which are quite small, develop very rapidly, the period of incubation being about seven or eight days. The male watches over the eggs and takes charge of the fry when they are hatched, keeping the latter together just as a shepherd's dog herds a flock of sheep.

The bow-fins, which feed upon insects and crustaceans, as well as upon other fish, are capable of living out of water for several hours on end.

Of the two sexes the male grows to a length of about eighteen inches, while the female measures about twenty-four inches long.

The eel-like *Gymnarchus*, one of the African

beaked-fish, is a nest builder. By means of its sharp teeth it severs the stems of aquatic plants and constructs therewith a floating domicile measuring as much as four feet across. Within this shelter the young ones are born and pass the first three weeks of their lives. When fully grown the *Gymnarchus* attains to a length of six feet, or even more.

Very remarkable nests are those made by the pretty little Chinese paradise-fish, the structures being composed of bubbles and mucus produced from the fishes' mouths and formed into floating and bowl-shaped masses. After these fairy-like abodes have been completed the males, which alone are responsible for their construction, collect the eggs laid by the females, seizing them in their mouths and placing them in the midst of the frothy mixture.

They then stand guard over the ova, and from time to time blow fresh bubbles around them. Should any of the eggs happen to become detached from the nest, they are immediately replaced.

The paradise-fish has long been domesticated in China, from whence it was introduced into Europe. It attains to a length of about three inches, possesses a large forked tail, and is very brightly coloured. Moreover, it is blessed

with a very hardy constitution, for not only will it thrive and breed in very confined quarters, but, according to a well-known authority, it will "live in water strongly impregnated with acid."

The Siamese fighting-fish is another species that indulges in the practice of making a nest of bubbles.

Found in Tropical and Southern America is a group of fish known as mailed cat-fish. They build nests, composed of grass and leaves, that are frequently placed above water within a muddy hole or depression in the soil situated at the edge of a pond or stream. Within this structure the eggs are laid, and when the young ones hatch out they make their way overland to the water, thus following the example set by their parents who, during the dry season when the waters of their habitat run low, make a practice of undertaking terrestrial journeys in order to reach fresh quarters that are more to their liking.

Although not actually nest builders, another member of the cat-fish family, known as *Arius*, is worthy of special mention inasmuch as the male carries the eggs laid by the female in his mouth, where they remain until the young ones hatch out.

During the incubation period the devoted father abstains from all food, and even after the fry are hatched he is always ready to offer them a haven of refuge in times of danger by opening his mouth and allowing them to enter.

The remarkable habit of carrying the eggs in the mouth is by no means confined to the foregoing, for some perch-like fish belonging to the *Cichlidae* family indulge in a similar practice, although it is the females and not the males that nurse the eggs. With one of these, known in Egypt as the "bolti," the male prepares a nest for the accommodation of the female. Mr. C. A. Boulenger gives an extremely interesting account of his personal observations of this fish, published in the *Proceedings of the Zoological Society.* He writes: "The nests are merely basin-shaped holes scooped out in the sand, usually among reeds or tamarish bushes. The largest one I saw measured just over a yard in diameter and one-and-a-half feet deep. I had the good fortune to be able to watch a bolti at work on one of these nests. The latter was nearly completed when I commenced my observations at the beginning of May, and was occupied by a large male; there were no signs of a female in the neighbourhood. The male remained

by himself in the nest during the two days I observed him, and was occupied chiefly in smoothing down the sides of the excavation; this he did revolving round and round with his tail in the centre, brushing away dirt from the sides of the nest with his fins. On the third day I returned early to the nest and found it unoccupied. A short distance away, however, the same male was to be seen, now accompanied by a female."

In the *Aspredo catrachus*, also a member of the cat-fish family, the under surface of the female's body becomes very soft and spongy during the spawning season. After laying her eggs, she presses upon them with the soft part of her anatomy so that they adhere to her body, in which situation they remain until the young ones are hatched out.

The habits of the mailed tube-mouths (*Solenostoma*), the pipe-fish of the genus *Syngnathus*, and the sea-horse (*Hippocampus*), are quite as extraordinary as those of any fish we have so far reviewed, for the creatures carry and incubate their eggs within the shelter of abdominal pouches. With the female of the former genus, the edges of the pelvic or breast fins unite with the skin of the under surface of the body, thereby con-

stituting a baggy pouch from which numerous thread-like growths arise that serve the purpose of keeping the eggs securely held in their proper place.

In the case of the above-mentioned pipe-fish, however, it is the males that are provided with a pouch, this being formed by folds of skin arising on either side of the body and tail, and joining underneath, except at the hindermost extremity where the entrance to the "brood chamber" is situated. This snug retreat not only serves as a receptacle wherein the young undergo their development, but also as a place of refuge for the newly hatched fry.

Some of the pipe-fish, however, do not possess a pouch but merely a groove upon the under surface of their bodies, and even that may be absent in certain species.

The male sea-horses of the genus *Hippocampus* possess a pouch situated underneath their tails wherein to carry the eggs laid by the females, but others that are not thus endowed resort to the practice of embedding the ova in the soft skin of their caudal appendages.

In conclusion, brief mention must be made of the spawning habits of the gunnel or butter fish, for after the female has laid her eggs she

gathers them together in the form of a ball, and both parents, first the one and then the other, assist in the incubation by coiling their bodies around them.

CHAPTER III

UNNATURAL NATURAL HISTORY

THAT old beliefs die hard is well exemplified in regard to Natural History, for, notwithstanding the much vaunted cry of advanced education at the present day, it is astonishing to note how many errors are still regarded as truths concerning the various members of the animal creation. Unfortunately, these misconceptions are often of a very mischievous nature, and many a harmless or even beneficial creature is unjustly maligned and persecuted without cause.

Let us take the case of the slow-worm or blind-worm, for instance, a creature that is a boon to gardeners on account of its habit of feeding almost entirely upon slugs. Many people are under the impression that it is a snake whose bite is as dangerous as that of an adder, but in spite of its snake-like appearance the reptile is really a legless lizard, while it is extremely gentle, quite harmless, and never attempts to bite a person attempting

to pick it up. A ready means of distinguishing the creature from a snake is to look at its eyes which, unlike those of the latter, are furnished with eyelids. When a slow-worm dies the eyelids close, a fact that has probably given rise to the erroneous belief that the reptile is blind.

Our common lizard is another creature that is supposed to be of a venomous nature, and not long since the farmers in Abergavenny complained that they attacked their sheep, and suggested that the matter should be inquired into by the Ministry of Agriculture.

Snakes appear to be very popular subjects for misrepresentation, and it is quite a commonplace to hear a person call the forked tongue of one of these reptiles its "sting," whereas that member does not possess any power of inflicting injury. Then, again, the manner in which a snake travels along the ground is often wrongly depicted in illustrated books. Frequently it is shown progressing with its body poised in vertical and wavy loops, but, in reality, the undulations are always in a lateral and horizontal plane, the under part of the creature's body remaining in contact with the ground. Even the names of certain snakes are often associated with curious beliefs,

the hoop-snake being said to hold its tail in its mouth and then roll along the ground like a hoop being trundled, while the garter-snake has been reported to be used by ladies for the purpose of holding up their hose. Another story still regarded as a probability by some people is that snakes enter houses by burrowing beneath the foundations and coming up inside the premises.

The old story of toads being discovered alive after having been entombed for ages in the midst of a mass of coal, rock, or stone, without any communication with the air, crops up from time to time, and evidently still receives a certain amount of credence. Needless to say, no animal can survive without a supply of air, and although many reptiles can forego food for lengthy periods without suffering any ill effects, yet if this abstention is too prolonged, death ultimately ensues. It is true that toads are sometimes found alive and imprisoned within the cavities of rocks or some such situation, but when these instances have been investigated by competent authorities, it has always been found that a means of communication was present which admitted air, and even food in the form of insect life, although the fissure itself was not sufficiently large to allow

the prisoner to escape from its enforced domicile.

Mr. Buckland, in his well-known book, *Curiosities of Natural History*, gives an interesting account of experiments made by his father to demonstrate the falsity of the statement that toads could be entombed alive without air or food, and yet live for a number of years. He prepared two blocks of stone, one of sandstone and another of limestone, making twelve holes in each measuring about five inches in diameter. Glass lids, cemented along the edges with clay so as to render the enclosures impervious to air, were then placed over the top of the holes; and into each of these cells he introduced a live toad, and buried the stones beneath the ground to a depth of three feet. After an interval of thirteen months the stones were dug up and the imprisoned toads examined through the glass lids. Those which had been enclosed in the sandstone were dead, but those placed within the more porous limestone were still alive; the small amount of air and moisture that permeated through the latter substance proving sufficient to sustain the inmates in a more or less torpid condition, while, moreover, it is more than probable that minute insects found their way through the limestone and so

assisted the creatures to survive for so lengthy a period. The experiment, although revealing the remarkable vitality of the toads, proved conclusively that they cannot live without a supply of air.

Another old belief in regard to a toad is that it possesses a jewel in the head, but this may be considered as a poetical allusion to the bright bronze tint of the creature's eyes.

Many strange stories of imaginary creatures have been handed down from ancient times. The basilisk, spoken of as the "King of Dragons and Serpents," was said to be able to wither up all vegetation with its breath, while its glance was fatal to man. As a means of protection against its deadly power, however, it was only necessary to hold a mirror before the monster with the result that its death-striking glances were reflected upon itself. Julius Caesar Scaliger, born in 1484, states:—"Since some have suspected the stories of the basilisk are fabulous, I will write down what I have read in modern authors. When Leo was Pontifex Maximus there was found lodged under the arch near the Temple of Lucia a basilisk, by the breath of which Rome was afflicted with a terrible plague. . . ." In 1691 G. C. Kirchmayer gives an even more remark-

able story concerning the creature, stating:— "They say the basilisk is born of a cock. The cock, when decrepit, brings forth an egg from which the basilisk springs. The egg must be placed in a warm heap of dung or hatching done by a repulsive toad. Then a chicken is hatched, which has a tail like a snake, but the rest of its body that of a cock." The egg was said to have no shell, but to have a skin of such strength that it could withstand the severest blow. Another description of the basilisk represents it as possessing eight feet and two enormous scales for wings, while its head was surmounted with a "Kingly crown." In spite of the alarming appearance of the creature, we read that it would fly from the presence of a weasel or cock.

The phoenix was another fabulous creature stated to exist in the days of our ancestors. It was reported to be a bird of enormous size, and the only individual in existence. The manner in which it managed to assure the continuity of its species was to reappear from its own ashes. That its span of life was supposed to be of considerable length may be judged by the writings of Pliny, who stated that it lived for 660 years. Herodotus, however, considered that 540 years was the limit,

while Seneca gives the figure at 500, and Albertus at 350 years. Pliny also tells us that the phoenix was regarded in Arabia as sacred to the sun. When it grows old it constructs a nest composed of cinnamon and thyme, filling it with scented herbs, and so soon as this is completed the giant bird reposes upon it and dies. We are further told that a creature like a worm arises from its bones and marrow, from which, in turn, comes a fowl. This, as its first act, performs the funeral rites of the worm, after which it flies off with the nest to near Panchaja, a city of the sun, where it places its burden upon the altar.

Ovid says that its tears are of incense and its blood of balsam, while another narrator tells us that when the bird felt its span of life was drawing to a close it flew up into the air to such a great height that the heat from the sun burnt its body to ashes.

Although the unicorn is familiar to everyone on account of its association with the Royal Coat-of-Arms, yet according to the ancients it was once a living creature that had the misfortune to perish in the great flood. Described as a four-footed and untamable animal, about the size of a horse, and pos-

sessing a long single horn sprouting from its forehead, the unicorn was said to inhabit the wild regions of Syria, Arabia, Ethiopia and India.

If the horn of one of these creatures was thrown into hot water, it caused bubbles to rise to the surface; while a ready means of distinguishing a genuine from a spurious one was to inscribe a circle upon the ground with the tip, and then place a lizard, spider or scorpion within the magic ring. Should the horn be that of a unicorn the creatures did not endeavour to escape, but otherwise they promptly ran away.

Dragons have always been a fruitful source of tales, both in ancient mythology and in more modern fairy tales, and it is recorded that on October 16, 1691, a flying serpent, having been killed with much difficulty by a hunter, was brought from Rome.

Then, again, the sea-serpent is another creature that has inspired many people to give glowing accounts of gigantic monsters capable of swallowing ships, but we have yet to await any reliable evidence that such an animal exists. Pliny, Olaus Magnus and Denys de Monfort all give remarkable descriptions of the sea-serpent, the latter, whom a modern writer designates as "an accomplished

liar, with an imagination worthy of better things," giving an account of one of these creatures which raised its head above water to such a great height as to overtop the masts of the ship he was in.

Of later records that have been handed down of these monsters, we read that in 1848 a captain of a ship saw a gigantic sea-serpent of which over sixty feet of its length was visible to the eye; while in 1875 another individual appeared from the depths of the ocean and proceeded to encircle its body around a whale that happened to be in the vicinity, the victim being crushed to death in the serpent's coils, and the breaking of its ribs producing loud cracking sounds. It is also recorded in *The Animal World* that in 1877 the officers and crew of H.M. yacht *Osborne* forwarded a report to the Admiralty that on June 2 of that year they saw a huge serpent swimming in the water off the coast of Sicily. Its length was stated to be about 150 feet, and its head was like that of an alligator. It measured twenty feet across the shoulders, and its back was surmounted by a row of fins. What was the real nature of the creature is difficult to say, and although it is not impossible to conceive that unknown forms of sea monsters may exist at the pre-

sent day, yet the majority of sea-serpent stories, at all events, must be regarded as "terminological inexactitudes" which can only be received with a "pinch of salt."

A very peculiar story, regarded as true in days gone by, was that of the Barbary Lamb, a creature supposed to be half animal and half vegetable, this remarkable freak being figured in old woodcuts as a lamb-like animal hanging from the branches of a tree with the posterior end of its anatomy enclosed in foliage.

Of an equally sensational nature is the story of the barnacle-goose, a bird that was said to originate from ship-barnacles. That the story was accepted as genuine by people of intelligence may be judged by stating that Sir Robert Moray, first President of the Royal Society, read a paper at a meeting of that body in 1661 in reference to the bird's remarkable evolution; while one writer even went so far as to state that he had observed barnacles fall from the face of rocks, and then gradually change into geese. It appears that the monks living at that period had no difficulty in accepting the mysterious nature of the barnacle-goose, and as the bird was considered to be neither flesh or born of flesh, it was therefore

entitled to be classified as a fish, and eminently suitable for serving at table on fast days. Pope Innocent III, however, put an end to the popular habit of feasting upon the bird on days of abstinence, proclaiming that it could not be regarded as being otherwise than a bird.

One has only to glance through old books to find that many superstitious beliefs in regard to animals flourished in the days of our ancestors; and even at the present time they still retain a firm hold in the minds of many people, as instanced by the popular belief that it is unlucky to keep a peacock's feather in the house.

By some folk in Scotland snails are supposed to be endowed with the power of fortune-telling, and we read in Hone's *Everyday Book* that: "The month of May has always been deemed peculiarly favourable for supernatural appearances. No one will marry in May; but on the first morning of that month, maidens rise early and gather Maydew, which they throw over their shoulder in order to propitiate fate in allotting them a good husband. If they can succeed by the way in catching a snail by the horns, and throwing it over their shoulder, it is an omen of good luck; and if it is placed on a slate, then likewise it will

describe by its turnings, the initials of their future husband's name."

It was also said of the greatly maligned toad that a person would die should he eat a leaf of a tree beneath which one of the creatures had burrowed, while to handle a living one would cause the venturesome person to have a violent attack of cramp. Should, however, a horse, cow, or sheep have cramp or a sudden illness, the cause of the malady was believed to be due to a shrew having crawled over the victim, and in order to give relief to the sufferer it was necessary to place a leaf plucked from a *shrew-ash* upon the affected part—the shrew-ash being an ash tree that had been specially medicated by having a hole bored in its trunk with an auger, and a live shrew imprisoned within the cavity. When once a tree had been prepared in this manner, its healing properties were said to last for ever.

Another method by which shrew-struck horses were treated was to drag the animal through the enclosed area made by a branch of a bramble, the upper end of which had bent down and taken root again in the earth. That the shrew was regarded with much disfavour in the past may be judged by quoting the words of Topsell, who states: "It is a ravenous beast feigning itself gentle and tame, but

being touched it biteth deep and poysoneth deadly. It beareth a cruel minde, desiring to hunt anything, neither is there any creature that it loveth."

Quite a number of errors and exaggerated statements have found their way into print in regard to the habits of wild animals, not the least remarkable being the story of the mongoose entering the throat of crocodiles in order to kill the reptiles. Then, again, we read that the ibex hurls itself from the precipitous rocks of its habitat into the valleys beneath, saving itself from injury by alighting upon its horns, the elasticity of which absorbed the shock.

In a like manner the hedgehog is said to utilize its spiny armament as a buffer when falling from a height.

The old story of the porcupine shooting out its quills at an adversary, thus emulating the deeds of an archer, is a fable that is still believed by many people; the misconception probably having arisen owing to the fact that a loose quill may be jerked out when the animal suddenly erects its prickly armour.

Yet another instance of a perversion of the truth is the story concerning the nesting habits of the flamingo. As is well known, the bird constructs a cone-shaped nest, made

of mud and measuring a foot or more in height, upon the summit of which the female deposits her eggs. "When the bird is sitting," to quote from a popular Natural History book published less than a score of years back, "she has her legs stretched out behind, hanging in the air (that is to say, unsupported), like the arms of a man when he puts them behind his back and throws his shoulders forward"; while another variety of this fiction is to the effect that the bird straddles across her nest and reposes upon the top with her long legs dangling one on either side.

As a matter of fact there is nothing unusual about the nesting habits of the flamingo, and when incubating her eggs the female squats down upon them, and folds up her legs beneath herself.

The tails of animals appear to have been a source of inspiration for imaginative writers to exercise their gifts upon, and it has often been stated that the beaver uses its caudal appendage as a sort of mason's trowel for the purpose of constructing the mud walls of its dam. The lion has also been credited with the habit of utilizing its tail for the purpose of lashing itself into a state of fury, the small and spur-like nail situated upon the end of

that member, and concealed by the tuft of hair, serving as a scourge. That the tail of a lion, however, should be used as a weapon of offence is an even more remarkable belief, but one person, at all events, was labouring under that delusion, for the writer once heard a working-man remark to his wife as they stood before the cage of a lion at the Zoo, "Just fancy him being able to kill a man with a blow of his tail."

Mention must be made of the mermaid concerning which much has been written in the past. Valentyn, a Dutchman, states that during a storm in the year 1404 a mermaid was driven through a hole made in the dyke at Edam, and was subsequently captured. She was taken to Haarlem, and the womenfolk took such an interest in her that they taught her to spin. Her education proceeded apace, it seems, judging by the report that she died several years afterwards in the Catholic Faith. The same authority also tells us that in 1653 a lieutenant was leading some soldiers along the sea-shore in Amboina when they suddenly espied a mermaid with long, flowing and greenish-grey hair disporting herself in the waters; while Albert Herport records the appearance of both a merman and a mermaid together in the water; and in 1714 another

mermaid was stated to have been captured near the Island of Boors.

What type of creatures these supposed mermaids and mermen really were it is difficult to state; but it has been suggested that the dugong or manatee has given rise to many of these old stories, the shape of the animal's body resembling to an imaginative mind the outline of a human form, while the manner in which the female clasps her young one to her breast with one flipper, and swims about by means of her disengaged limb, at the same time keeping her own and her baby's head above water, adds to the illusion. So-called mermaids and mermen are not infrequently exhibited by travelling showmen, but these are fakes which usually take the form of stuffed or dried specimens of fish with varying embellishments attached, such as representations of human heads.

Many old beliefs are of a very humorous nature, and the ancient fallacy that the elephant had no joints is, to say the least, somewhat astonishing. Owing to its supposed unfortunate condition the creature was unable to lie down, so in order to rest its ponderous frame it was forced to sleep with its body leaning against a tree. This method of repose, however, was not without its disadvantages,

for hunters, seeing the animal fast asleep, would creep up to the tree and saw through the stem, with the result that the elephant came toppling to the ground and was unable to get up again.

Equally extraordinary was the fable concerning the badger. In an old dictionary the following description is given of the creature: "Badger (also called Bawsin), a wild four-footed beast somewhat larger than a fox, and resembling a hog and a dog. It dwells in burrows, lives on insects, carrion, and fruit, stinks very much, fattens by sleeping, and shows its age by the number of holes in its tail, one being added every year."

Then we have the poetical type of Natural History fairy-tale, of which an excellent example is that concerning the argonaut or paper-nautilus, a creature which belongs to the mollusc family, dwells in a shell, and possesses eight mobile arms, two of which terminate in flattened expansions. According to report the argonaut utilized its shell as a boat, its body reposing inside, and six of its arms being thrust outside and used as oars, while the two specially developed ones were held aloft and employed as sails. Unfortunately, this charming story is not based upon

fact, the creature progressing by discharging water through a tubular organ known as a siphuncle, and thereby forcing itself backwards through the water.

That insects have fallen victims to many false reports is not surprising when one considers that they are generally regarded as objectionable creatures by the majority of people. A harmless moth, known as the death's head on account of the skull-like pattern on its head, has been held responsible for causing an epidemic of disease, while the death-tick or death-watch beetle has the evil reputation of foretelling the death of human beings, notifying the approaching event by giving rise to a tapping sound. This noise is produced by the creature knocking its head against the decayed timber of houses or old furniture wherein it ensconces itself and, instead of being an omen of bad fortune, is merely the natural manner by which the insect signals to its mates.

The earwig is another much-maligned creature, popular opinion crediting it with the habit of entering the ears of human beings. It receives its name, derived from two Saxon words, namely *ear*, a bud, and *wigga*, a worm, owing to the creature's habit of concealing itself in the buds of flowers, and is in no way

associated with a propensity for exploring the auditory organs of mankind.

Although it is hardly necessary to state that a whale is a mammal and not a fish, yet a considerable degree of misconception appears to prevail in regard to its habit of "blowing" or "spouting." It is frequently stated that the creature, when thus engaged, ejects a spout of water from its nostrils, whereas, in reality, it merely expels its breath before making a fresh inspiration, the air thus discharged from its warm body becoming condensed as it comes into contact with the cold atmosphere, and forming an ascending jet of vapour. Should, however, the whale commence to blow while its nostrils remain just below the surface of the ocean, as frequently happens, a small proportion of water will be forced upwards and become mingled with the vaporized breath.

In former days it was believed that the chameleon lived on air alone, while the salamander was supposed to be able to exist in the midst of fire, and even to be evolved from very intense heat. Then, again, the vampire bat has been credited with the habit of sucking the blood of human beings while they sleep, the creature fanning its victims with its wings in order to induce them to slumber more

heavily. Yet another fallacy is that the cuckoo sucks birds' eggs to keep its voice clear, while many country people declare that the mole can live for a considerable time without breathing, thereby enabling it to survive when floods invade its underground domicile. Possibly, however, these people have overlooked the fact that the creature is able to swim, so that there would be no need for it to exercise its reputed powers.

The tench has been the subject for many *fishy* stories, for not only was it supposed to be immune against all kinds of diseases, but it was also regarded as possessing the power to heal the maladies of other fish, as well as those of human beings, by rubbing its slime-covered body against the sufferers. This story, however, is outrivalled by the statement that swifts hibernated under water during the winter months.

Many people are under the impression that monkeys are usually infested with fleas, but as a matter of fact they are quite innocent of harbouring vermin unless confined in dirty quarters. Their energetic toilet, that invariably gives rise to much merriment in the beholder, is not undertaken for the purpose of ridding their coats of fleas, but in order to

procure the minute particles of scurf which adhere to their skin, and have a salty flavour which greatly appeals to the taste of the monkey folk.

Then, again, our ancestors believed that the various members of the crane family made a practice of carrying stones in their beaks during their migratory flights in order that they should be prevented from uttering their scream-like cry and thus reveal their presence to birds of prey. It was also stated that the birds placed sentinels at night to act as guards while the other birds slept, the watchers standing upon one leg and clasping a stone in the disengaged foot. Should a sentinel get drowsy he would involuntarily relax his grip upon the stone, which would then fall to the ground, the noise thereby produced causing the bird to wake up and, it is to be hoped, increase his vigilance.

A very common misconception in regard to the crane is that the long feathers of the wing tips constitute the bird's tail, whereas, in reality, the tail feathers proper are comparatively short and entirely concealed by the former when the wings are closed. In a like manner the feathers that form the peacock's train are usually designated its tail,

AN ARCTIC FOX IN WINTER DRESS.

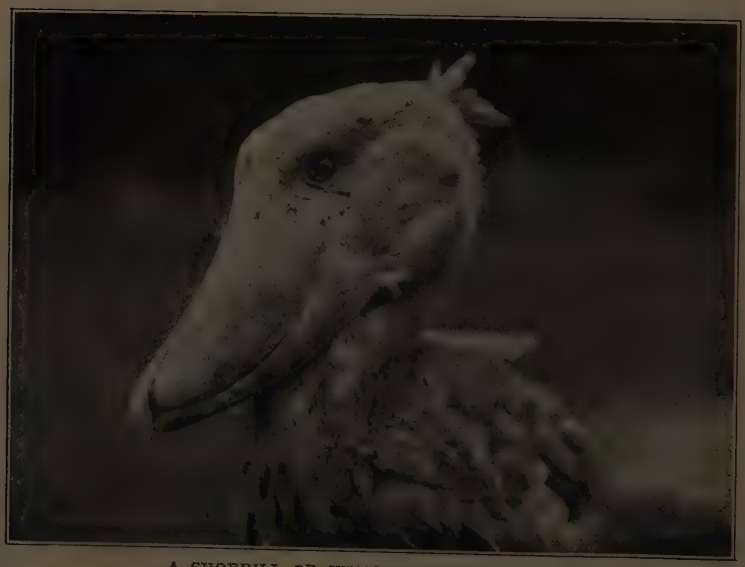
See p. 75.

THE BEAK OF A HORNBILL IS NOT SO HEAVY AS IT LOOKS.

See p. 79.

THE TOUCAN POSSESSES AN ENORMOUS AND BRIGHTLY COLOURED BEAK.

See p. 80.



A SHOEBILL OR WHALE-HEADED HERON.

See p. 81.

but the real tail feathers lie beneath, and act as a support to the longer train-feathers, more especially when the bird is indulging in its display.

The wren has for long been associated with many curious beliefs, both by the ancient Greeks and Romans, as well as by more modern people. The country-folk in parts of Brittany believe that if their children touch the young birds in their nests they will be punished for so doing, and stricken with a malady known as "the fire of St. Laurence," which appears in the form of pimples on the face and legs. In other regions of France it is stated that if a person kills a wren, his fingers shrivel up and ultimately drop off, or, as an alternative, his house will be struck by lightning, or his cattle have sore feet.

Mention must be made of the popular error that the land-tortoises, so frequently sold by hawkers, are useful for the purpose of ridding gardens of slugs, and kitchens of beetles, whereas they are entirely vegetarian in diet. The flat-shelled water-tortoises or terrapins are, however, carnivorous.

Yet another common mistake is that a camel has two humps and a dromedary but one, and although this supposition is correct to a certain degree, it must be pointed out

that there are both one and two-humped camels, and only the better breeds of the former, that are specially trained for riding purposes, are called dromedaries.

CHAPTER IV

ANIMALS THAT CHANGE COLOUR

THE power to change colour is a gift that Nature has bestowed upon various animals, including amongst their numbers both mammals, birds, reptiles, and fish; but none of them has achieved such fame in this respect as the chameleon.

Although popular opinion has credited this creature with the faculty of changing from one colour to another in a few seconds, yet, in reality, the transformation is quite a gradual process. It is brought about by the contraction or expansion of numerous cells situated under the animal's skin, which are arranged in layers, and contain different coloured pigments; the tint of the chameleon depending upon how many of these layers are brought into use at any given time, and the extent to which the individual cells are opened or closed. The phenomenon is largely governed by the emotions of the creature, and is influenced also by light and temperature; a low tem-

perature and a subdued light inducing it to assume pale tints, while a powerful light and a high temperature has just the reverse effect. The more usual colours exhibited by the animal are varying hues of green, yellow, and brown; but patches of pink, salmon, and orange tints may be present at times.

Apart from its colour-changing habits, the chameleon is remarkable in many other ways. The eyes, for instance, work within their sockets upon the cup and ball principle, and each one can be moved independently, so that the creature has the power to look in front and behind, or above and below itself at the same time. The hands and feet are divided into two separate, opposable, and flap-like portions; the digits of the fore limbs numbering two on the outer and three on the inner section, and those upon the hind limbs being arranged in just the reverse manner. The tongue, which is furnished with a club-shaped and sticky growth at its extremity, is so long that the creature can project it beyond its mouth for a distance exceeding the length of its own body; while to add to these many peculiarities, the long tail is of a highly prehensile nature and serves as a fifth grasping organ, enabling its owner to cling to a branch or twig with great tenacity.

Several of the lizards are able to effect a transformation in the colour of their skin, one of the most notable being the variable lizard found in India, Ceylon, Southern China and the Malay Peninsula. When excited, the reptile expands its throat and changes the colour thereof from a pale yellowish tint to an intense scarlet hue, for which reason it is frequently called by the name of "blood-sucker."

The Carolina or red-throated anolis is also capable of changing colour; indeed, its power in such respect is even greater than that of the chameleon. Normally the lizard is of a bright green tint, but sometimes it assumes greyish and brown hues under the influence of certain conditions of light and temperature. When aroused by anger it distends the dewlap upon its throat, which then turns bright red in colour.

The phenomenon of colour transformation is by no means unusual among the frogs, and even our common species is able to alter the tint of its skin. Sir Joseph Lister records having taken from the recess of a rock a specimen which was almost black in colour, but after he had placed it in the sunshine upon a flagstone, it gradually changed to a dusky yellow tint, mottled with dark spots. On

being returned to its former situation the creature then reverted to its original colour after an interval of a quarter of an hour.

The European tree-frog is another example which changes its colour according to its surroundings, for when reposing upon the earth, or amidst dead leaves, it is of a brown tint, but when it sits upon growing foliage it assumes a bright green livery.

Even more remarkable is the behaviour of Gough's tree-frog, from Trinidad, which undergoes the most wonderful transformations of colour. Sometimes an individual may be brown upon the back, at other times yellow or grey; while, moreover, the anterior half of the creature may be of a different hue from the posterior half, or the left side of a different colour from the right side. The skin may also be decorated with various coloured designs, sometimes in the form of an hour-glass, and at other times as cross-bars, and even both together, these patterns rapidly appearing and disappearing.

Then, again, in reference to the colour-changing habits of yet another species of tree-frog, Sir Emerson Tennent states: "One of these beautiful little creatures, which had seated itself on the gilt pillar of a lamp on my dinner-table, became in a few minutes scarcely

distinguishable in colour from the ormolu ornaments to which it clung."

Passing to the fish, we find that certain kinds have the power to appear in various coloured liveries. The tench is an expert in adapting itself to its surroundings, for whereas it assumes an almost uniform yellowish-green tint when dwelling in clear water, yet if that element be dark or muddy it becomes almost black upon the upper part of its body, and somewhat lighter below.

Many other of our well-known fish are able to change their colour, and in reference to this fact Mr. A. H. Cocks, in a letter to the *Zoologist*, writes: "I have not forgotten my astonishment . . . when, having temporarily placed a mixed lot of fish (roach, dace, gudgeon, and probably two or three other species . . .) in a white bath, where they were, of course, very conspicuous, I found, after a short time (perhaps less than an hour, but certainly under two) that they had become quite pale and inconspicuous."

The Japanese fighting-fish will transform their normally dull-coloured hues into dazzling metallic tints when aroused by anger; while golden and red transverse bands will appear upon the bodies of the pretty little paradise fish under the influence of sunlight, whereas

if they be placed in dark or muddy water they become of a brown hue.

Minnows, sticklebacks, and trout also have the power to alter their colour to suit their habitat.

The late Mr. Buckland relates that a certain fishmonger of his acquaintance was able to tell the locality from whence the trout displayed in the latter's shop came, by their colour alone; and in a like manner a fishmonger at Billingsgate professed to be able to judge from which part of the coast the various fish were procured.

There can be no doubt that the colour of the waters wherein fish live has a distinct bearing upon the tint of their bodies. Trout which dwell in clear and fresh water are bright in colour, while those found amidst waters that have become discoloured by peat are dull and almost black. It has also been observed that the fish that resort to the deeper parts of a river are of a darker colour than those that frequent the shallows.

It is interesting to note that the silvery appearance common to so many species of fish is due to the presence of numerous and very small crystals which repose upon the scales. The bright red, blue, and green colours, however, that decorate the bodies of other fish,

arise from coloured oils that reside in cavities situated beneath the skin, and change their position according to the mental state of the fish, or under the influence of its surroundings.

The octopus is another creature that has the power to alter its colour. Darwin states: "They appear to vary their tints according to the nature of the ground over which they pass; when in deep water, their general shade was purplish-brown, but when placed on the land, or in shallow water, the tint changed into one of greenish-yellow. The colour, examined more carefully, was a French grey, with numerous minute spots of bright yellow; the former varied in intensity, the latter entirely disappeared and appeared again by turns. These changes were effected in such a manner that clouds, varying in tint between a hyacinth-red and a chestnut-brown, were continually passing over the body."

Among the crustacea we have an example in the common prawn that is able to alter its colour from a dark to a light tint so as to render itself as inconspicuous as possible amidst its surroundings. Æsop's prawn (*Hippolyte varians*), however, is far more remarkable, for not only does it assume various colours such as green, red and brown, in order to harmonize with its habitat, but it indulges

in periodic changes during day and night. Messrs. Keeble and Gamble in their description of the species, tell us that "every evening, as darkness comes on, Hippolyte gradually loses its distinctive diurnal colour. In summer this change begins at about 9 p.m., in winter about 5 p.m. . . ., as darkness falls Hippolyte is seen to become of a wonderful azure blue colour and absolutely transparent, except in the region of the liver and stomach. . . ."

A quite distinct phase of colour transformation to that which we have so far reviewed is the seasonal change that takes place in certain animals.

Among the mammals that are thus influenced, the stoat may be taken as a typical example. During the summer its fur is mostly of a brown tint, but in the colder part of its habitat the pelage of the creature changes to white at the approach of winter, the tip of the tail, however, remaining black at all seasons.

It is a curious fact that, although the animal grows a new coat in the autumn, it is not always the case that the change in the colour of the fur coincides with the actual shedding of the same, a great deal depending upon the atmospheric conditions at that period. For instance, should the weather be somewhat warm when

the creature is changing its summer for its winter coat, the new fur appears of the same colour as that previously worn, and does not alter until the colder weather sets in. On the other hand, if the weather is cold when the winter pelage commences to grow its colour is white at the outset.

The arctic-fox and the mountain-hare are other creatures which wear different-coloured liveries during the summer and winter months.

A large number of the feathered folk assume different hues after their periodic moults, but it is not always that the change of colour is due entirely to the production of new feathers, for in the ptarmigan, a bird which indulges in the practice of wearing a different suit during the summer, autumn and winter months, the pigments of the feathers undergo a transformation of tint.

Abnormal colour changes may sometimes occur in animals, which in some cases may be due to selective breeding, and in others to some "sport" of Nature. The writer has seen a green tree-frog which, to use a somewhat "Irish" expression, was of a bright blue tint; while yellow, as well as sky-blue, varieties of the familiar and normally green-coloured budgerigars or love-birds have been successfully reared and established as distinct

strains. In the case of the latter the transformed colour is of a permanent nature, and is brought about by the eradication of yellow or black pigments which together make green; the absence of the yellow pigment, and the combining of the black with a white pigment secreted by certain cells, giving rise to the blue tint; and the yellow tint being produced by the loss of the black pigment.

CHAPTER V

BIRDS WITH QUEER BEAKS

ALTHOUGH birds lack the mobile features common to many of the mammalian members of creation, yet they possess in the bill or beak an organ which endows them with a considerable degree of character.

In this country there are quite a number of birds that have curious forms of beaks, but it is in foreign climes that the more extraordinary examples occur, some of them possessing such peculiar bills as to render their owners almost grotesque in appearance.

In past ages certain birds possessed teeth, but at the present day none is thus endowed. With many young birds, however, a so-called "egg-tooth" is present, this being a small, pimple-like and hard outgrowth of the bill which is utilized by the unhatched chick to break its way from out of the egg, and afterwards shed.

Nearly all birds possess an external covering of horn to the beak, but the ducks and

flamingoes prove an exception to the general rule inasmuch as that member is clothed with a layer of soft skin, except at the tip. It is also interesting to note that the situation of the nostrils differs in various species of birds. In the majority the nasal orifices are placed a short distance from the base of the bill, but in the gulls, geese and cranes they are at the centre, while the flightless apteryx of New Zealand is unique in having them at the extreme end.

It is, however, to the more curious forms of beaks that we desire to draw special attention in our present chapter, and in this respect no bird is more remarkable than the crossbill whose beak is unlike that of any other member of the feathered folk, the end of the lower mandible curving upwards and crossing over the upper one in a manner that suggests a malformation rather than a normal condition. This peculiarity, however, proves of great service to the bird, enabling it to obtain the seeds from the fir cones upon which it so largely subsists, by forcing back the scale-like growths that overlay them.

Only the adult birds possess this extraordinary form of beak, that of the young being of the more usual straight type.

There are quite a number of birds that

call for special comment on account of the enormous size of their beaks, and of these the hornbills are especially noticeable owing to their bills frequently being decorated with a casque or helmet-like protuberance, of varying shape and size, that arises from the upper mandible.

One of the most remarkable of these birds is the rhinoceros hornbill which possesses a casque furnished with an upturned and horn-like growth that suggests the horn of a rhinoceros.

In nearly all instances these enormous casques are by no means so heavy as they look, the interior being composed of a network of cellular structures. That of one species, however, is solid throughout, and of considerable weight. Indeed, so similar is it in appearance and consistency to ivory, that the Chinese frequently make use of it as a basis for their carvings.

Although these gigantic beaks act as most efficient weapons of defence and offence, and can but receive the respect due to them from any adversary rash enough to come within striking distance thereof, yet they are believed to serve an additional purpose, the cellular interior acting as a resonator, and increasing the volume of the bird's cry, which is exceptionally loud.

Of the various kinds of hornbills, the smallest is about the size of a jay, and the largest as big as a hen turkey. With the exception of two species known as ground-hornbills, all are arboreal in habits. The tree-dwellers occasionally come to the ground, however, and progress in a series of lop-sided leaps, but the ground-hornbills walk in a very stately manner and are also curious because they possess very pronounced eye-lashes.

Even more grotesque than any of the foregoing is the bill of the toucan. Indeed, were it not for the fact that the shell of that member is extremely thin, and the interior of cellular structure, it would prove too heavy for its owner to carry. But judging by the bird's alert and active disposition, it evidently does not find the size of its beak in the least inconvenient. Possibly it may even be proud of such a distinctive feature for, apart from its enormous size, it is rendered very conspicuous by its bright colouring, the tints varying in the different members of the family.

The toco toucan, the largest of its kind, has a bill of a bright orange-red hue, decorated with a black patch at the tip. The beak of the sulphur-breasted toucan, another well-known species, is even more brilliant, various

THE BOAT-BILLED HERON.

See p. 82.

THE SPOONBILL POSSESSES A UNIQUE TYPE OF BEAK.

See p. 83.

THE BILL OF THE FLAMINGO IS UNLIKE THAT OF ANY OTHER BIRD.

See p. 83.

THE GREATER FRIGATE BIRD—BOTH MANDIBLES OF THE BEAK ARE BENT DOWNWARDS AT THE TIP.

See p. 83.

shades of red, blue and green forming the colour scheme; while that of the ariel toucan, one of the smaller forms, about the size of a jackdaw, is yellow and black.

That the toucan's beak is somewhat sensitive may be judged by the fact that the bird has been observed to scratch it with its foot. Why Nature should have provided such a large bill is, however, somewhat of a mystery, although the suggestion has been made that it enables its owner to reach fruit growing from the end of slender twigs that would otherwise be inaccessible owing to the weight of the bird.

The toucan comes from South America, and is said to derive its name from two native words meaning "nose of bone." This term is certainly an appropriate one, but hardly so quaint as the description given by one writer who designated it as "a bird smaller than its own beak."

It thrives well in captivity, and becomes quite tame. When roosting, the bird tucks its enormous beak beneath its wing, and, to ensure an extra degree of comfort, then turns its tail over upon its back to act as a blanket.

For the acme of grotesqueness in bill development, we may well introduce the reader to the shoebill or whale-headed heron, a bird that looks more like the phantom of

a nightmare than a living creature. It is somewhat rare, of an unsociable and savage disposition, and inhabits the swampy regions of the White Nile river.

Its immense boat-shaped bill is slightly concave on the top, and composed of a number of sections, the central portion of the upper mandible terminating in a claw-like nail which serves as an admirable instrument for securing a firm hold of the fish upon which it feeds. The edges of the bill are extremely sharp, and one bite at a fish is sufficient to sever it in half. When flying, the shoebill draws back its head and rests its cumbersome bill upon its fore-neck.

The boat-billed heron is another bird that is somewhat similar to the foregoing in regard to the boat-like shape of its bill, except that that member is convex in profile instead of concave. It inhabits the wooded banks of the Brazilian rivers, is known by the natives as the "*savaku*," and feeds upon worms and aquatic creatures, for which it makes diligent search by dabbling in the mud with its enormous and curiously-formed beak.

Among the smaller wading birds we find the majority possess long and tapering beaks that are well adapted for capturing their prey amidst the shallow waters of their habitat.

These vary very much in form in the different species, some of them being straight and dagger-like, others curved in a downward sweep such as that of the curlew, while the avocet is unique in the fact that it possesses a bill that curves upwards. The spoonbill is even more specialized than any of the foregoing, its beak being very broad throughout its entire length, and terminating in a flattened and spoon-like expansion.

The flamingo possesses a curious form of beak that almost defies a verbal description, the front half being bent down at an abrupt angle to the rest. Such an unusual formation might at first sight appear to be an encumbrance to its owner, but when one considers the stature of the flamingo, and more especially the length of its neck, it will readily be seen that the bird, when searching for its food as it wades amidst the shallow waters, must of necessity turn its head almost upside down when thus engaged, the bent portion of the beak then being poised more or less parallel with the surface of the ground, and serving as a perfectly-formed scoop.

Yet another peculiar beak is that of the frigate bird, which, besides being of great length, is curious on account of the fact that both the upper and lower mandibles are of

equal length, and hooked downwards at the extremities. Although many other birds, such as the eagles and vultures, are characterized by the sharply-hooked ending of the upper mandible, yet in these the lower one is invariably of a more or less straight type, and overhung by the upper one.

The pelicans are a group of birds that not only have a very highly-developed form of beak, but in addition they possess a capacious and dilatable pouch, attached to the lower mandible, and capable of holding a large quantity of food.

Unfortunately, this somewhat unusual capacity for storing food does not always prove an unmixed blessing, for notwithstanding that the pouch may be capable of holding a dozen fish or more, yet, as only one of these can be swallowed at a time, when other hungry pelicans are in the immediate vicinity the bird must either retain the fish unswallowed within its pouch, or else run the risk of their being appropriated by its companions when released for individual attention.

During the courtship season the males of the white pelican acquire one or more horny and upstanding excrescences upon the upper mandible, which are ultimately shed.

There can be few people who fail to respect

a macaw's beak, or do not regret their lack of forethought should they ever have done so, for not many birds can be said to possess such business-like instruments with which to nip a finger. The upper mandible of a macaw is boldly curved in a downward sweep, and has the under edge notched in a most curious manner, while the lower mandible is comparatively small, and shovel-like in form. Like all other members of the parrot family, they have the unique power of being able to move the upper portion of the beak, this being rendered possible by the presence of a transverse hinge upon the skull.

The scissor-bill possesses a beak that is remarkable for its peculiar formation, for not only is the lower mandible considerably longer than the upper, but both portions are flattened laterally like a knife-blade, except at the extreme base or gape, where they swell out and form a junction with the skull. The bird feeds entirely upon fish, skimming over the surface of the water with the long lower mandible dipped beneath the surface, and the upper one raised above. Should any small fish happen to strike against the moving and submerged portion, it is instantly forced upwards and caught in the angle formed at the junction of the two mandibles.

Equally curious is the beak of the open-bill, which displays a cavity or gap between the closed mandibles, the utility of which is unknown.

Although the different sexes of birds are often denoted by the varying colour of their plumage, yet in the huia bird of New Zealand we have an example in which the male and female may be distinguished by the form of the beak alone, that of the former being of an inconspicuous, short, thick, and slightly curved type, while that of the latter is both slender and long, and arched downwards in a very prominent manner.

So far we have reviewed some of the more curious types of birds that arrest attention on account of the large size or unusual formation of their beaks, but there still remain to be mentioned certain members of the feathered folk in which the bill is nearly non-existent. Foremost among these is the night-jar, in which the beak is reduced to little more than a pair of knob-like excrescences situated at the front of the mouth. As, however, the bird feeds entirely upon insects and beetles which it captures on the wing as it flies with wide-open mouth, the lack of a more powerful beak is in no way detrimental to its welfare.

Attention must also be drawn to a group

of birds known as curassows, many of which possess curious embellishments of the beak which usually take the form of brightly-coloured and bulbous outgrowths; while in the puffin we have an example that indulges in a double form of beak. When seen in this country during the summer months, the latter bird is easily recognized by its brightly-coloured and compressed beak which is of much greater depth than length. But should we see the same during the winter, we might easily be excused if we failed to recognize it, for during the moulting season the brightly-coloured outer covering of the beak falls off, and reveals a small and soberly-coloured structure beneath which is the beak proper.

CHAPTER VI

ANIMALS AND THE WEATHER

NOT many factors govern the lives of the denizens of the earth more than the weather—heat, cold, dampness, dryness, fog, and mist, all affecting their well-being, fashioning their habits, moulding their destiny, and also having a direct influence upon their health by regulating the spread of disease.

Although disease is ever present amidst us, yet a healthy creature dwelling under natural conditions is endowed to a certain extent with the power to fight against the evil, this power or partial immunity having been handed down from generation to generation. But if an individual be forced to change its normal habitat and environments, it is liable to come into contact with diseases it has not hitherto been called upon to face, or against which it has not received any inherited immunity, with results that are likely to prove fatal.

This fact is revealed very clearly in regard

THE CAPACIOUS MOUTH OF THE PELICAN.

See p. 84.

A CURASSOW, WITH CURIOUS BEAK DECORATION.

See p. 87.

SAM AND BARBARA, THE VETERAN POLAR-BEARS AT THE ZOO.

See p. 89.

JOHNNY, THE FAMOUS GORILLA.

See p. 91.

to the polar bear which, in a natural state, dwells in a very cold climate where the malady commonly known as a "cold," including such ailments as influenza and pneumonia, cannot exist, the germs or microbes responsible for disseminating those illnesses being unable to thrive in such a low temperature. But if one of the animals be brought to warmer climes where the microbes can flourish, it is apt to suffer in consequence. Should, however, its vitality be sufficiently strong to withstand the onslaught of the germs at the outset, it gradually gains a more or less permanent degree of immunity against their attack, and is enabled to live amidst them without being exposed to greater risk than other creatures dwelling under similar conditions.

In further allusion to this point, let us take the case of Sam and Barbara, the famous polar bears at the London Zoo. That they have attained sufficient power of resistance against the attacks of pneumonia and such ills to enable them to live in our fickle and, from their point of view, abnormal climate, is proved by their present flourishing condition, as well as by the great number of years they have dwelt in the Gardens. But that this immunity is of a personal nature,

and in no way inherited, is made manifest by the fact that it does not descend to their offspring, for although Barbara has given birth to nearly a score of young ones during her sojourn in captivity, yet not a single one has survived for more than a week or two, every individual having succumbed to the attack of the microbes responsible for causing bronchial or pulmonary trouble in its varying forms. Should, however, she ever succeed in rearing some babies, and these in turn have cubs of their own, there would then be reason to hope that the latter would be able to survive the critical period of their existence, for each successive generation would gradually benefit by the degree of immunity attained by the parents against the malignant microbes.

Apart from the initial dangers attending the introduction of living creatures to a climate unlike that to which they have previously been accustomed, there is always the risk of their becoming infected with illnesses through the mere fact of being brought into close contact with human beings who are prone to carry germs about with them. For this reason the chimpanzees and other anthropoid apes at the London Zoo are separated from the public by a dividing screen of plate-glass which not only helps to keep away obnoxious

germs, but also wards off the evil effects arising from wet umbrellas and clothing.

That inherited influences prove a valuable means of enabling a living creature to fight the battle of life is exemplified in a very remarkable and unusual manner in regard to a young gorilla, named Johnny, that was brought to this country a few years back and exhibited at the London Zoological Gardens during the summer months. Now, a gorilla is one of the most difficult of animals to keep alive in captivity, for even when dwelling in a warm and congenial climate it shows its resentment at being made a prisoner by sulking and refusing food, with the result that it quickly dies. When, in addition, the creature is forced to face the discomforts of an unnatural and altogether unsuitable climate, the difficulties are greatly increased.

Before the advent of Johnny, no gorilla had ever lived in this country for more than a week or two, but he proved a remarkable exception, for instead of moping and pining away in the manner of his forerunners, he was blessed with boisterous spirits and a vigorous constitution, and lived for over five years in captivity.

Before his death he only had one serious illness, and then he refused all food for several

days so that it was feared he would die. All sorts of delicacies were placed before him, but without avail, until, as a last resource, it was suggested that a pineapple might tempt his appetite. This was soon procured and offered to the ailing ape, who immediately devoured every particle of the fruit, as well as most of the leaves, and from thenceforth he rapidly regained health and strength.

How then do we account for the fact that Johnny succeeded in passing no less than five winters in England, thereby breaking all records of longevity in captivity for one of his kind? The answer to this query, although at first sight appearing somewhat difficult to believe, but, nevertheless, accepted as being true by competent judges, is that Johnny, who was known to have been captured when quite a baby, was mothered by a black woman, her maternal attentions endowing her simian foster-child with the cheerful disposition of a normally healthy human infant, and also giving him a degree of immunity against ailments which he would not have been brought into contact with in the ordinary course of events, but would meet when living in an entirely different climate to that of its native home, and amidst unnatural surroundings.

We have heard a great deal of late years about the "open-air" cure as a means of combating and curing illness, and although there cannot be the slightest doubt that fresh air and sunshine are Nature's greatest health-givers, yet, like other medicines, the doses must be taken with moderation and judgment, for what is one man's meat is another man's poison.

Excessive heat or cold is only to be borne with impunity by those who have been accustomed to endure it, and it is absurd to expect an animal hailing from the tropics to thrive in the Arctic or Antarctic regions, or *vice versa*. It is true that they can be gradually accustomed to withstand a considerable degree of variation in temperature, and in this respect nobody has achieved greater success than Mr. Karl Hagenbeck, the well-known importer of wild beasts, who writes: "I am quite convinced that it is possible to transplant lions to any climate whatever, provided they are allowed out into the open during spring when they are young." In former days it was always considered necessary to keep captive lions and tigers shut up during the winter months in houses warmed to a somewhat high temperature by means of hot-water pipes, but to-day it is recognized that

coddling is not only detrimental to their health, but even induces illness.

In spite of popular belief, it is quite a mistaken idea that animals from the tropics revel in very hot sunshine. The Indian tiger seeks the shade of the forests and jungles during the heat of the day, the elephant is also intolerant of the burning rays of the sun, while excessive heat has been known to cause the death of snakes.

Many creatures undergo a prolonged period of rest or æstivation throughout the hottest period of the year, during which they remain in a dormant state; while in cold climates this state of affairs is reversed, hibernation or winter sleep being indulged in in order to escape the severity of the weather and, more important still, to enable them to tide over the time when food is scarce. During these periods of inactivity the creatures sustain life by absorbing into their systems the fat they have stored up in their bodies during times of plenty.

Animals living in very cold countries are provided with thick fur, as well as a generous supply of fat underlying their skin, and it is owing to these provisions of Nature that the polar bear is enabled to enter the water amidst the ice floes of its habitat without suffering

any undue inconvenience, but, curiously enough, when once it has become accustomed to dwell in a warmer zone it no longer appreciates Arctic conditions. It becomes "soft," to use a common expression, and refrains from entering its bath during the winter—ice-cold water no longer appealing to its taste.

As already mentioned in a former chapter, a number of animals change the colour of their coats during the varying months; the Arctic fox, the stoat, the blue or mountain hare, and the willow-grouse being notable examples of creatures that assume a white livery during the winter months, and more sombre hues in the summer time.

The change, however, is not a constant one, for only in the colder regions of their habitat do they undergo the transformation.

Biting winds and hard frosts often have a marked effect on the behaviour of living creatures, and we all know how tame our birds will become during an exceptionally hard spell of weather, and how they look to mankind to assist them in procuring the food which Nature has withheld from them for the time being. The advent of winter also heralds the approach of numbers of sea-gulls to the metropolis, and it is a never-failing

source of enjoyment to watch them as they skim alongside the parapets of the bridges crossing the Thames, and deftly catch the offerings of food that the city workers throw to them.

Seagulls, moreover, are able to foretell a change in the weather, and their powers in such respect are officially recognized by the Meteorological Office, the various observers who send in their reports to that body being instructed to watch the movements of the feathered prophets. When the birds fly inland, stormy weather is likely to ensue; but if they travel out to sea, settled conditions are indicated.

That many other living creatures are endowed with an instinct that enables them to foretell a coming change in the state of the atmosphere is a well-known fact. Sheep will gather together at the approach of a storm and take shelter under trees and hedges. They appear to be able to judge to a nicety whether the disturbance is going to break in their immediate neighbourhood; and if it is likely to pass over, no matter how black the sky may be, they take little notice of the threatening outlook. The movements of horses and cows at pasture in the fields are also indicative of weather changes. The former leave the

open ground when storms are brewing and seek the best available shelter, while the latter grow restless and, instead of spending the greater part of their time reposing upon the grass and chewing the cud, get up and roam about the meadows in a disconsolate manner.

Frogs and toads are also foretellers of changes in atmospheric conditions, for during the dry weather they hide up and are conspicuous by their absence, but when rain or dampness approaches they become more lively and venture forth from their hiding-places.

In some countries it is the custom to keep frogs in glass cases within which are erected small ladders. If the inmates repose at the bottom of the ladder they are supposed to forecast fine weather, but if rain or unsettled conditions are approaching they proclaim the fact by sitting at the top.

It is not surprising to note that sunshine has a marked effect upon the behaviour of animals, and although excessive heat may cause discomfort or even death, yet, in moderation, nothing can be more beneficial to the health and spirits of all living creatures than the rays of the sun. Birds will bask in the sunshine and spread out their wings to the

fullest extent in order to receive the grateful warmth upon them, while at other times they will lie down on the ground with one wing spread out and held aloft in such a manner as to expose the under surface to the sun. The hornbills will often repose upon the ground with their heads turned sideways as if they were endeavouring to get their faces sunburnt, and the writer has even known a tawny or brown-owl so far to forget its reputation for being a bird of the night as to sit upon the ground at midday, and spread out its wings to greet the sunshine.

Our domestic cattle are very fond of standing in water on a hot day, the act of immersing their extremities in cool water while their bodies are exposed to the heat from the sun appearing to afford them much satisfaction; but the Indian buffalo does not believe in this half-and-half measure for, when feeling too hot, it submerges its body beneath the waters of a stream, and remains there with only its head above the surface until it is sufficiently refreshed. At other times it will wallow in the mud without any consideration for its subsequent appearance.

That a hot and sunny day is conducive to laziness is no less true in regard to the lower creatures than to mankind. The monkeys

become lethargic and sprawl about on their perches, and the lemurs will sit up and spread out their arms so as to receive the maximum amount of sunshine upon their persons.

Under like circumstances the various members of the dog family give vent to their feelings by panting with their mouth wide open and their tongue lolling out, this phenomenon being due to the fact that they are only able to perspire through that organ. The period of the calendar known as the "dog days," and extending from about July 3 to about August 11, has always been associated with dog madness, the so-called dog-star, or Sirius, which rises and sets with the sun at that time, supposing to exercise a baneful influence upon our canine friends.

Certain fish are also affected by weather conditions. The North Atlantic basking-shark, which attains to a length of more than thirty feet, indulges in the habit of lying motionless on the surface of the water during warm and calm weather with its back exposed to the grateful influence of the sun's rays. In a similar manner the sword-fish will bask in the sunshine, its enormous dorsal fin being expanded to its fullest extent when thus engaged.

Mr. Frank Buckland also tells us that "eels are very sensitive to changes in the weather, and they are generally on the move when thunder is about, or, in other words, when the atmosphere is charged with electricity." He further records the fact that in January, 1851, during a spell of very severe weather, thousands of conger-eels were seen floating on the sea in a certain locality, no less than eighty tons of the fish being captured in a very short time. Although they were quite lively and were swimming about on the surface of the water, yet, curiously enough, they had not the power to escape from their captors owing to the fact that the intense cold had distended their air-vessels to such an extent as to close the valvular openings, thereby rendering the fish so buoyant that they were incapable of swimming downwards.

Rainy weather, although regarded with disfavour by some creatures, is, on the other hand, greatly appreciated by others, and those of us who cultivate gardens will know how snails come forth from their hiding-places after a shower. In the winter months, however, they bury themselves beneath the earth, sealing themselves up within their shells by secreting a membrane-like shield across the base, the structure being composed of slime

and calcareous matter which is of a porous nature, and admits a sufficient supply of air for their needs during their winter sleep.

CHAPTER VII

A TALK ABOUT CRABS

THE majority of people if asked to give a brief description of a crab would probably define it as a crustacean or, to use a more popular term, a shellfish that dwells in the sea, and although this description may be applicable to most species, yet it is incorrect in regard to others, for some live in fresh water, and those known as land-crabs pass the greater part of their existence upon *terra firma*.

Before, however, we introduce the reader to the more interesting forms of crabs that are to be found in various parts of the world, it may be of interest to give a brief account of their development and transformation.

All undergo a series of changes before they attain their adult form, the larva, after leaving the egg, which, by the way, may be no larger than a mustard seed, being a diminutive and transparent body possessing six arm-like appendages. It is then spoken of as being in the

Naupilus stage. But only certain species of crabs pass through this stage, others emerging from the egg in a more advanced form called a zoëa.

The zoëa of the common, green, or shore-crab is a most extraordinary looking object. Its head, from the top of which arises a long and upstanding spine-like growth, is very large in proportion to the rest of its body, while its "face" terminates in an elongated and sharp beak. The eyes, moreover, are remarkable for their enormous size.

When once the larva has completed its metamorphosis and assumed the crab form, it sheds its shell periodically so long as it continues to grow. If it did not do this the creature would be unable to increase in size owing to the hard and unyielding shell preventing the body from developing.

No hard-and-fast rule applies to the intervals between the moulting periods, a great deal depending upon the amount of food the crab is able to obtain, and the consequent rate of its growth. It is interesting, however, to give records in regard to a specimen kept in captivity, the first change taking place on April 11, the second on May 22, a third on July 3, a fourth on August 30, and another on September 21.

Not only is the shell of the body shed during the moulting periods, but the covering of the antennæ and legs, as well as the lining of the gills, stomach, and eyes, is also discarded. The new shell, formed beneath the old one, is quite soft at first, but gradually becomes hardened — this transformation sometimes taking but a few hours to complete, while at other times it may be extended over a period of several days. Before the shell has become hard, the crab is quite defenceless and runs great risk of being devoured by its enemies; but in order to avoid such a calamity as far as possible, the creature hides itself within the crevice of a rock, from whence it does not venture forth until its armour is in a serviceable condition.

The general appearance of the shore crab is so familiar as to need no detailed description, but it is not generally known that the sexes can readily be distinguished the one from the other by the size of the tail, that of the male being narrower and more pointed than that of the female. It appears that these crabs possess a remarkable homing instinct, for experiments carried out by the Eastern Sea Fisheries Commission have proved that if one of the creatures be removed from its native locality it will make every effort to return.

Not long since, more than 2,000 crabs were captured, marked, and liberated at a considerable distance from their home. Several hundreds of these were subsequently recaptured in their old haunts.

Some brought from Yorkshire and set free in the sea off the South Lincolnshire coast were retaken, either in their original locality or near by; the distance covered during their journey in some cases being more than eighty miles. Another instance is recorded of a crab travelling from Scarborough to Boddin—close to Montrose in Scotland—a distance of about one hundred and fifteen miles.

Another familiar species is the great or edible crab, which may readily be distinguished from the green crab by its more oblong shape, the brick-red tint of its shell, and the superior size of the adults. It has for long been esteemed as an item of diet, and we read that the Romans regarded its flesh as a great delicacy.

Searchers along the seashore, however, must not expect to find one of these toothsome morsels, unless it be a very small one, for they always take care to remain in situations from whence the tide never recedes.

Although the majority of crabs are unable to swim, and can only progress by walking along the ground with their characteristic

sideways gait, yet those known as swimming crabs, of which several species are to be found around our coasts, possess specially developed legs, the last pair being flattened, and terminating in oval, plate-like structures that serve as oars and enable the creatures to make their way through the water in any direction. One of the better-known kinds is the velvet swimming-crab, so called on account of the thick covering of short hairs upon the upper part of its shell. It is a handsome species, the general greyish tint of its shell being relieved by a violet-coloured border, while the feet, more especially the flattened plates, are barred with black stripes. The fore claws are decorated with scarlet and azure tints, and the eyes are vermilion in colour.

A curious group of crabs are those known as spider-crabs because of the triangular form of their bodies—the carapace being broad at the back and narrow in front. In some kinds, moreover, the limbs are of such extreme length and slenderness as to resemble those of a spider. Of the various species found in British seas the spinous spider-crab or thorn-back crab is one of the most familiar. It attains to a considerable size, a specimen taken in Liverpool Sound having measured eight inches in length and six inches in breadth.

Spider crabs are experts in the art of concealing themselves, for by fixing pieces of seaweed and other marine growths upon their rough shells they render themselves quite indistinguishable from their surroundings.

That the crabs realize the protective nature of this procedure is proved by the fact that some seaweed-covered specimens when placed in an aquarium, the bottom of which was covered with small sponges, promptly removed their original dressing and replaced it by one of a nature similar to that upon the ground.

But the most remarkable of all spider-crabs is that known as Kämpfer's crab, which claims the distinction of being the largest of all crustaceans. It comes from Japan, and the males are so huge that they are able to span as much as eighteen feet with their outstretched legs.

Belonging to a different family to the spider-crabs, but resembling them in the triangular form of their shells, is a species known as the Northern stone-crab. Found in British waters, but restricted in range to the Northern regions, the creature is of large size, and peculiar in the fact that when viewed from above only three pairs of legs (instead of the usual four pairs) are visible in addition to the chilipeds or those bearing the nippers; the fourth pair

being folded up and concealed within the gill or branchial chambers.

Passing to those crabs that dwell in fresh water we find one of the commonest is the South European river-crab, a species found in considerable numbers amidst the muddy banks of Lake Albano, and also in the vicinity of Rome, in which city it forms a popular dish. Some members of the group, however, forsake the water for the greater part of their time and lead a terrestrial life; but these must not be confused with the true land-crabs, of which numerous examples are to be met with in tropical regions.

Of the latter, one of the best known is the Countryman crab (*Gecarcinus ruricola*), found in Jamaica. It resides in the neighbourhood of the sugar-cane plantations, and is stated to be very fond of feeding upon the juice from the cane, doing a considerable amount of damage and destroying numbers of young plants by eating the growing shoots.

Land-crabs travel for considerable distances, and are usually found about two or three miles from the coast. During the spring months the females lay their eggs in the sea, the whole colony forsaking their inland retreats and making for the shore. At times the migrating crustaceans are so numerous as to

extend for upwards of a mile in length, the column, led by the males, often covering a width of a hundred and twenty feet. So intent are they upon reaching their destination that nothing will induce them to diverge from their path, and should they come across a house, cliff, or even a church during their march, they go straight on and climb over the obstacles rather than make a detour.

When the females have finished laying their eggs, the whole party marches inland once again, where they remain until the following spring.

A certain land-crab found inhabiting the mangrove swamps of the West Indies has a very evil reputation, for although its normal diet consists of fruit, yet, according to the report of Dr. Duchassaing, those that take up their abode in the vicinity of cemeteries feed upon the interred bodies, the creatures burrowing beneath the ground in order to obtain their meal.

A very specialized group are the swift land-crabs (*Ocypoda*) which are able to run so swiftly across the sandy beach of their habitat as to make their capture a difficult feat to accomplish.

So accustomed are they to living on land for extended periods that their breathing

organs have become specially adapted for such a state of existence, and if one of the creatures be immersed in water for twenty-four hours it will drown. These crabs dwell together in small colonies, each individual providing itself with a deep and perpendicular burrow excavated within the sand. Should one of them happen to enter a wrong "house" by mistake when returning from its wanderings above ground it is promptly informed by the rightful owner of the domicile, who makes a scraping sound, that its presence is not required, whereupon the intruder quickly departs and endeavours to find his own quarters.

Another curious form, found in Brazil and other parts of the world, is the beckoning, calling, or fiddling crab as it is variously called, in the males of which one claw is of such an enormous size as to exceed the bulk of the creature's body. So abundant are they in their haunts that thousands may be seen at one time peeping out of their sandy burrows, or running over the surface of the sand. Mr. Alcock gives a very interesting account of these crabs in his book, *A Naturalist in Indian Seas*. He states: "Landing one afternoon upon a cheerful mud-flat . . . I was bewildered by the sight of a multitude of small pink objects twinkling in the sun, and always, like

will-o'-the-wisps, disappearing as I came near to them, but flashing brightly on ahead as far as the eye could reach. It was not until I stayed perfectly quiet that I discovered that these twinkling gems were the brandished nippers of a host of males of *Gelasimus annulipes*. By long watching I found that the little creatures were waving their nippers with a purpose—the purpose apparently being to attract the attention of an occasional infrequent female, who, uncertain, coy, and hard to please, might be seen unconsciously sifting the sand at the mouth of her burrow. If this demure little flirt happened to creep near the burrow of one of the males, then that favoured individual became frantic with excitement, dancing round his domain on tiptoe and waving his great cherry hand as if demented. Then, if another male, burning with jealousy, showed a desire to interfere, the two pigmy suitors would make savage back-handed swipes at one another, wielding their cumbrous hands as if they were no weight at all."

These grotesque little creatures are very useful to mankind for, like the earthworm, they bring up the subsoil during the excavation of their underground burrows and cast it upon the surface several feet from the entrance. On their return journeys they will take back

pieces of vegetation, some of which is eaten by the crabs, while the remainder rots away and forms the nucleus of a new soil. On some of the coral islands of the Eastern Archipelago the crabs are gradually converting mud-flats into dry land, and although the process is naturally a slow one, yet owing to the enormous numbers of the creatures, as many as one hundred burrows sometimes being located in an area measuring but two feet square, the work proceeds faster than one would expect.

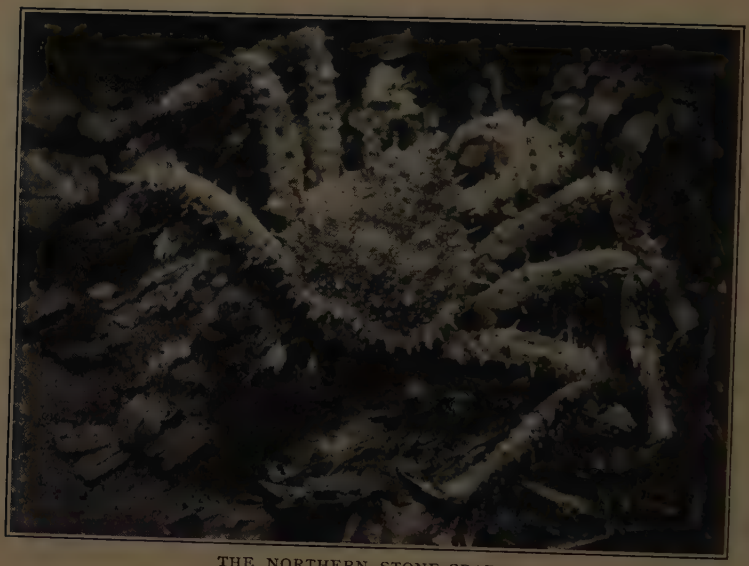
The Keeling or Cocos Islands in the Indian Ocean are the homes of some crabs that not only pass the greater part of their existence upon land, but are also partially arboreal in habits, the crustaceans climbing coco-nut trees for the purpose of feeding upon the fruit. Known as robber crabs or coco-nut crabs, these creatures attain to a considerable size, a length of a foot or more being by no means unusual. They belong to the group of hermit-crabs, but differ from the typical forms, in which the body is naked and unprotected by a shell covering, by having the upper surface furnished with horny plates. They make their homes in deep burrows which they excavate beneath the roots of trees, and within the privacy of these sanctums they

A TAWNY OWL BASKING IN THE SUNSHINE.

See p. 98.

A LEMUR GREETING THE RAYS OF THE SUN WITH OPEN ARMS.

See p. 99.

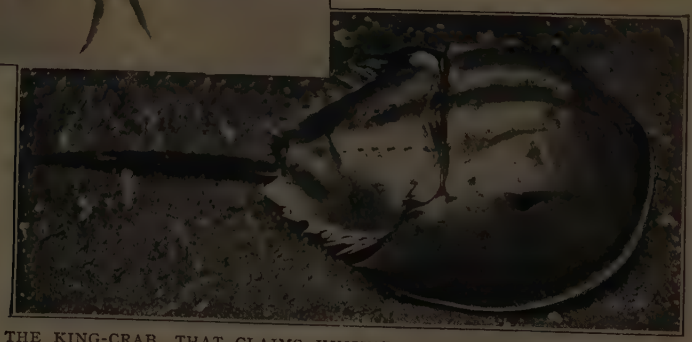


THE NORTHERN STONE-CRAB.

See p. 107.

THE SQUAT-LOBSTER—A SMALL CRAB FOUND IN BRITISH WATERS.

See p. 118.



THE KING-CRAB, THAT CLAIMS KINSHIP WITH THE SCORPIONS.

See p. 116.

prepare themselves beds composed of coco-nut fibre and husks. The natives of their habitat, knowing the habits of the crabs, dig down to the bottom of these homes and carry off the fibre so diligently gathered by the crustaceans, utilizing it for their own purposes. They will also eat its flesh, the fat stored on the under surface of the tail of the adult crabs being considered a special delicacy, while if the same be melted it forms a valuable oil.

Although it has for long been said that the robber crabs were in the habit of climbing coco-nut palms for the purpose of procuring the fruit, yet many people in the past were inclined to doubt the veracity of the statement. Recent observations, however, together with photographic records, leave no doubt that the crabs do actually climb trees, but it has been suggested that this is done merely for the purpose of securing the fibre and not as a means of obtaining the nuts, numbers of which are usually to be found lying upon the ground. This theory would certainly appear to be the correct one, for we must remember that the coco-nuts as we see them in shops are but the fruits that were formerly enclosed within large, hard, elliptical, and three-sided envelopes; and to expect a crab to be able to break

through such a formidable outer casing would be rather unreasonable.

How then does the crab manage to get at the kernel ?

First of all it selects a nut that has fallen from the tree top and been broken asunder from its outer casing. It then commences to tear away the fibrous growth upon the shell that covers the three " eye-holes " situated upon one end, and when these have been exposed it hammers upon them with its powerful claws until a hole is made right through. The extraction of the contents of the nut is then proceeded with by means of the smaller claws.

The robber crab is diurnal in habits, and visits the sea at intervals for the purpose of moistening its gills. Why it should have received its disparaging name is hard to say, for the act of securing its food can hardly be described as robbery.

If, however, any crab should be so designated, a species found in the Azores, known as the graspus, is the most suitable one to select. The animal dwells amidst the crevices of rocks, and is stated to be able to clamber up the face of almost perpendicular cliffs with ease. Should it happen to come across the nest of a tern during its peregrinations it does

not hesitate to steal the fish that the latter has secured for its own use, while, to add to its misdeeds, it will even drag the young birds from their homes and devour them.

Of the hermit-crabs that pass their lives in the sea, several kinds are to be found in British waters. Only the front half of these creatures is protected by a growth of shell, the posterior portion of their anatomy being quite naked and soft.

This state of affairs would naturally render them very vulnerable to the attacks of their foes were it not for the fact that they protect themselves by thrusting their tails into the empty shells of other creatures such as whelks or periwinkles, these sanctuaries being retained until the increasing bulk of the crustaceans renders it necessary for them to exchange their abodes for those of larger dimensions. Not content, however, with this method of outwitting their enemies, the crabs will often carry anemones upon their shells, the advantage of this association being of a very beneficial nature inasmuch as no fish will eat an anemone, but many will willingly dine upon the hermit —even including its shell. But if it is a choice between partaking of a two-course meal or of going without one, the fish chooses the latter alternative and the crab benefits accord-

ingly. Another advantage gained by this curious companionship arises from the fact that the crab is liable to be attacked by a parasite that pierces its body and causes its death, but if the crustacean be fortunate enough to have an anemone as a lodger it can afford to ignore the lurking danger, as the latter creature delights to feed upon the parasites.

With the king-crabs or horse-shoe crabs we come to a group that are somewhat of a puzzle to zoologists, for, notwithstanding their name, they are not true crabs but claim kinship with the scorpions—although to a remote degree. They are found in the waters of the Eastern coast of the United States, as well as off the coasts of Japan, China, and the Indo-Pacific Islands. The North American species is of considerable size, and possesses a large flattened carapace above which arise four eyes—one pair of small ones and the others larger. A long, pointed and whip-like tail protrudes from the hindermost portion of the shell, this organ being used as an implement for elevating the back part of the body while the broad and spade-like front margin of the shell is applied to the soft soil of the sea bed when the creature is burrowing. The tail also serves another purpose, enabling its owner to right itself should it turn upside

down. The creature is unable to swim, but crawls about the sand and mud in search of its food, which consists of marine worms and molluscs. For the greater part of the year king-crabs dwell in deep water, but during the breeding season they come into the shallows, and at high tide the females deposit their eggs in shallow depressions they scrape in the soil. The ova are then quickly covered up by the action of the ebbing tide, and the buried eggs get warmed by the sun's rays, so that in due course the young crabs hatch out, these being diminutive creatures decorated with a fringe of bristles around their rotund and tailless bodies. The absence of a caudal appendage is liable to cause the infants some inconvenience for should they turn topsy-turvy they have not the same means of righting themselves as is possessed by their parents. Nevertheless they are able to overcome the difficulty by forcing themselves upwards in the water by means of their gill plates, and as they descend once again they endeavour to regain their equilibrium.

Before concluding our remarks we would draw attention to an interesting genus called pea-crabs, so named on account of their diminutive size. Their habits are very peculiar, inasmuch as they make their homes within

the shells of living bivalves such as cockles and mussels. One species is found in considerable numbers off the Irish coast. Indeed, so plentiful is it in certain districts that one writer reports that in nine out of every ten cockles he opened a pea-crab was present inside the shell. It is further recorded that in some instances two or three of the crustaceans may be found in a solitary bivalve.

Then we have the masked crabs, so called because the upper portion of their shells is convoluted in such a manner that a rough, but nevertheless distinct, image of an uncouth human face is produced. One species known as the long-armed masked crab is found on our shores. Its antennæ, unlike those of the majority of crabs, are of exceptional length and furnished along their inner edges with a double row of stiff hairs which interlock in such a manner that when they are held close together a tube is formed through which the crab is able to obtain a constant supply of water while its body lies buried and concealed beneath the sand.

Another crab found in British waters is called the squat-lobster. In spite of its name, however, it is not a lobster, although in many respects it resembles one of those crustaceans. It is quite small, only attaining to a length

of an inch or so, and its elongated body terminates in an expanded and fan-like tail that is directed and held backwards, instead of being folded beneath the body as in the case of other crabs.

When the creature wishes to get about quicker than its legs can carry it, it suddenly snaps its tail forward and beneath itself, the resistance to the water thus offered causing the crab to shoot backwards through the water.

CHAPTER VIII

FROGS AND TOADS

FROGS and toads belong to a class of animals known as tailless batrachians, thereby distinguishing them from their allies the newts and salamanders which possess a caudal appendage.

Although the terms "frog" and "toad" appear to be somewhat elastic ones—some members of the tailless batrachians being referred to just as frequently under the one name as under the other—yet as a rough and ready means of distinguishing the two it may be mentioned that the typical frogs possess teeth in the upper jaw, whereas the true toads are toothless.

Nearly twelve hundred different species of frogs and toads are known. They are found in most parts of the world, being absent, however, in the Arctic and Antarctic regions, and in deserts where there is insufficient moisture to sustain their lives.

The young, known as tadpoles, originate

from eggs which are usually deposited in the water by the females, or occasionally upon dry land. But in some instances the eggs do not see the light of day, the young being born in an active state.

Before reaching maturity the tadpoles undergo a series of changes, and in the metamorphosis of the common frog the newly-hatched young one commences its free existence as an elongated creature with a large head and compressed tail, the mouth being furnished with small projections, known as "holders," which enable the creature to attach itself to water-plants. As growth proceeds the tail becomes much broader, a vertical and membrane-like crest arising both above and below that member. The limbs then make their appearance, the hinder ones being the first to show, followed a few days later by the front ones. Finally the tail is gradually absorbed into the system, the cleft of the mouth becomes much extended, and the creature assumes the form of a miniature frog.

The skin of adult frogs and toads is covered with numerous glands which, in the majority of the latter, are developed into wart-like excrescences upon the body and large swellings on the sides of the head, behind the eyes.

From these glands exudes a milky and poisonous fluid, which, however, is not as a rule of a very powerful nature, although sufficiently venomous to kill small animals or to cause a dog to foam at the mouth. But that of a South American species (*Dendrobates tinctorius*) is so potent in its action that the Indians utilize it for the purpose of poisoning their spears and arrows, while, moreover, it has the curious property if applied to the wounds caused by plucking the feathers from green Amazon parrots of changing the new plumage to a yellow tint.

Frogs and toads do not possess ribs, but the transverse processes of the backbone are so well developed that they compensate, to a certain extent, for the absence of this feature. Owing to this peculiarity the creatures are unable to breathe in the normal manner—that is to say, by the alternate expansion and contraction of the chest, aided by the ribs and attached muscles—but do so by what may be termed a swallowing or gulping process, the closed mouth serving as an air reservoir into which the atmosphere is conveyed through the nostrils, and afterwards forced into the lungs by the action of the tongue and the compression of certain muscles.

This curious method of respiration renders it an easy matter to suffocate one of these animals, for all that is necessary to do is to keep its mouth open and thus prevent it from inflating its lungs, the result being of a similar nature to what would happen if a hole were pierced in the leather sides of a pair of bellows, thereby rendering them incapable of pumping air.

With the exception of the African hairy-frog, from the sides and thighs of which arises a thick and hair-like fringe, the skin of all frogs and toads is naked. In some species the tongue is absent, but usually that member is of considerable size and capable of being protruded from the mouth for a considerable distance owing to the fact that the root is fixed at the front of the mouth with the tip directed towards the throat. When the animal shoots out its tongue the lower surface is then turned upwards and the extremity thrown forward.

One of the most remarkable of the tongue-less batrachians is the Surinam toad, a curious creature with a flattened, triangular-shaped head and small star-like growths arising from the tips of the front toes. A large flap or filament of skin also projects from either side at the junction of the jaws, while smaller

prominences are present in front of the eyes and on the upper lip.

It is, however, the spawning habits of this toad that render it so noteworthy, for the female carries her eggs upon her back, each one being embedded in a small pit formed in her skin, which becomes very soft during the breeding season. In this situation the eggs remain until the young hatch out, a hundred or more being carried in this manner.

How the eggs reached their curious resting-place was for long a mystery, but the problem was eventually solved by observations made of a pair of these toads that laid some eggs at the London Zoological Gardens in the year 1896. It was then revealed that the female protruded her bladder-like oviduct for a considerable distance beyond her body, curling it upwards and over the lower part of her back. The male then came to the assistance of his mate and, pressing upon the oviduct, forced the eggs out one by one, distributed them evenly over her back, and buried them in her soft skin. After the eggs were embedded a thin and horn-like lid gradually formed over the cavities, and within this retreat the young ones hatch out and undergo the whole of their transformation, coming forth after a period of eighty-two days as fully developed

toads, and making their way into the unknown world by pushing off the lids of their temporary domiciles. The skin of the mother's back then gradually dries up and is shed or rubbed off, the cells closing up and only leaving a small prominence to indicate where they previously existed.

Other tongueless batrachians are the smooth-clawed or spur-toed frogs, so called because the three inner toes of their hind feet are furnished with sharp, horny and spur-like nails. Their skin is quite smooth, and along either side of the body is present a row of small bright-coloured and tubular sensory canals which look as if the creature's skin had been sewn up with minute perpendicular stitches.

The species is entirely aquatic, while the tadpoles, which are born in a somewhat advanced state and have no external gills, are curious in the fact that they possess a pair of long filaments or barbel-like tentacles that arise on either side of the mouth. These first make their appearance a few days after the tadpoles hatch out, and grow very rapidly until they are as long as the creatures themselves.

Another curious feature concerning the tadpoles is that during the early days of their

existence they are so transparent that the brain and viscera can be seen through the skin.

The largest of all tailless batrachians is the Cameroon giant frog, which measures, when adult, nearly twelve inches in length; while the bull frogs, of which there are several species found in various parts of the world, are other representatives that arrest attention on account of their enormous size. Of the latter, which receive their name because of the loudness of their voice—their croakings being likened unto the roar of a bull heard in the distance—one of the most familiar is the American bull frog, which attains to a length of eight inches, and possesses a very broad and flattened nose. It inhabits the greater part of North America, and its flesh is considered a great dainty, so much so, indeed, that the frog was at one time threatened with extinction owing to constant persecution. As, however, the creatures are now largely bred in a semi-captive state in frog-farms, there is good reason to hope that such a fate is no longer to be reckoned as a possibility.

Another bull frog is found in India. Known as the tigrine frog, it may be distinguished from its American relative by its more pointed snout which overhangs the lower jaw, as well

as by its inferior size, a full-grown individual measuring about six inches in length. When frightened and fleeing from an enemy it indulges in the curious habit of leaping along the surface of the water in a similar manner to when progressing upon land.

A third species, namely the African bull frog or speckled frog, is about the same size as the American species. It spends much of its time underground, making its way beneath the soil by means of a shovel-like growth situated upon the inner-side of its hind legs.

To complete the list of the tailless batrachians remarkable for their enormous size, mention must be made of the giant toad found in Central and South America, as well as in the West Indies, a fully-grown individual measuring over six inches in length; while of even greater bulk are the American Ceratophrys, horned-frogs, horned-toads or barking frogs, as they are variously called.

The latter receive the name of "horned" because of the prominent nature of their upper eyelids, which, in one species especially, are developed to such an extent as to form upstanding and horn-like appendages; while the term "barking" refers to the bark-like cry they utter.

The animals are of a clumsy and ungainly appearance, their bodies being broad, short and barrel-like, and their mouths of enormous size. To make up for their lack of grace in regard to their figure, however, their skin is most beautifully coloured, the ground tint being sap-green, upon which are imposed numerous and somewhat large olive spots that are encircled with golden margins, red lines also being distributed in some instances between the spots.

Barking frogs have the name for being of a very savage disposition, attacking a person who molests them with great ferocity, and hanging on to their foes with the grip of a bull-dog. Indeed, so tenacious is their grip that they will even suffer death rather than release their hold. They spend the greater part of their time buried under the ground with only the top of their backs and their eyes showing above the surface, and in this manner they lie in wait for their prey which consists of small mammals, birds and other kinds of frogs.

Other burrowers, known as toad frogs, spade-foot or heel-clawed frogs, resemble the previously mentioned speckled frog in the possession of a shovel-shaped tubercle upon the foot which aids them in making their underground excavations.

AN AMERICAN BULL-FROG.

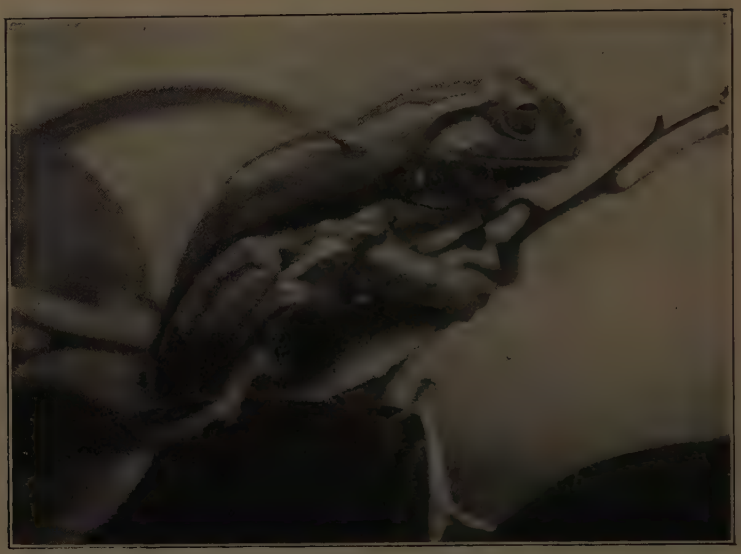
See p. 126.

THE INDIAN OR TIGRINE BULL-FROG.

See p. 126.

A BARKING FROG.

See p. 127.



WHITE'S TREE-FROG, FROM AUSTRALIA. ITS GREEN SKIN LOOKS LIKE WAX.

See p. 130.

THE EDIBLE FROG, THE HIND LEGS OF WHICH ARE REGARDED AS DAINTIES.

See p. 134.

The common spade-foot, found in Northern, Eastern and Central Europe, is peculiar in the fact that it exudes a very strong odour that smells like garlic, and for this reason it is often spoken of as the garlic frog.

A very interesting group are the tree-frogs, of which there are more than two hundred species. The common or European green tree-frog is one of the best known, and is frequently kept as a pet. The male, which may be distinguished from the female by the brownish tint of its throat, whereas that of the latter is white, has an exceedingly powerful voice, and when engaged in his vocal performance he blows out his throat like that of a pouter pigeon.

Notwithstanding that tree-frogs are excellent jumpers, they seldom avail themselves of their powers in this respect for evading their enemies, but usually rely upon their protective colouring to avoid detection. Some of them, however, are very brightly and conspicuously coloured, one kind found in Central America being sky-blue upon its back and rose coloured upon the under surface of its body; while another species from North America, known as the goose-footed tree-frog, is decorated with irregular cross-bars of red and fawn hues.

The golden tree-frog from Australia is a very handsome kind, its bright green skin being enriched with golden-bronze spots and streaks. It is stated that the Australian aborigines, when pressed by hunger, capture these frogs at night-time with the aid of a torch, and utilize them as food.

Also hailing from Australia is White's tree-frog, a somewhat large species measuring more than four inches in length. Its bright green skin is extremely smooth and shiny, looking almost like wax, or as if it had been varnished.

The tips of its fingers and toes are furnished with expanded disks, by means of which the creature is able to adhere to a smooth surface such as glass, the adhesion being effected by strong muscular pressure, aided by a sticky secretion that exudes from the disks.

The under surface of the body is also of an adhesive nature, the smooth and shiny skin clinging to the glass and retaining its hold by suction.

The habits of a small species of tree-frog discovered in Brazil by Dr. Goeldi are of unusual interest, for the female, which breeds in the water that has accumulated in the cup-like formations at the junction of the branches

of a certain kind of tree, carries her eggs upon her back, and retains them in position within a kind of pouch formed by small folds of skin on either side of her body.

In some Mexican frogs of the genus *Nototrema*, the females possess a pouch of a much more perfect nature, the skin gradually extending over the back during the breeding season until a completely closed chamber is formed. How the eggs are conveyed into this remarkable receptacle is not known, although it has been suggested that they are placed there by the male.

Equally curious are the habits of the tree-frogs (*Phyllomedusa*) which wrap up their eggs between several leaves of a tree overhanging a pond, fixing the edges together by means of a sticky secretion they produce, and leaving a small opening at the lower end of the nest through which the young ones fall when they hatch out, and drop into the water below. The female is stated to carry the male on her back while they proceed to fashion this curious domicile for their young.

These frogs are also peculiar on account of the structure of their hands and feet, the innermost digits of which are opposable to the remainder, so that when the creatures

are resting upon a twig they grasp their support in a manner similar to that of a monkey.

Other Brazilian tree-frogs fashion mud walls in the shallow puddles at the edges of streams and deposit their eggs within the enclosed area; while another species places its ova within the sheaths of decaying banana leaves and surrounds them with a frothy substance.

The breeding habits of the Alytes or midwife toad are very peculiar, for the male collects the strings of eggs laid by the female and entwines them around his legs, after which he hides himself in a hole in the ground or under a rock until the young are ready to emerge, when he makes his way to the water. During the incubating period of the eggs the devoted father only leaves his hiding-place for brief periods at night in order to obtain food and to moisten the eggs in the dew-laden grass. The midwife toad, which grows to a length of about two inches, is found in France, Western Germany, Belgium, Holland, Spain, Portugal and Switzerland.

Even more remarkable are the habits of Darwin's frog, a small species from Brazil that has a sharp and pointed snout terminating in a tubular projection. As in the above-mentioned Alytes toad, it is the male that

tends the eggs laid by the female. But instead of carrying them about outside his person he carries them inside, passing them into a pouch-like receptacle, an enlargement of the vocal sac which extends beneath the body and has two openings communicating with the mouth, one on either side of the tongue. Within this safe retreat the young ones hatch out and make their way into the world as fully developed frogs, leaping forth from their father's mouth.

Only four species of tailless batrachians are found in Great Britain, namely the common frog, the edible frog, the common toad and the natterjack toad.

Of these the first mentioned is by far the most plentiful, while its general appearance is so familiar to every one as to need no detailed description. It may be mentioned, however, that the creature is very variable in colour, some individuals being greyish, some brown, some yellow, and others reddish. Even white specimens have been known, and one of these albinos that was exhibited at the London Zoological Gardens some years back had red pupils to its eyes, instead of the normal black ones.

Although usually found in the vicinity of water, the common frog is not very aquatic

in its habits, but spends the greater part of its time amidst the herbage of the fields. During the breeding season, however, the creatures resort to the water, while in the winter the males not infrequently hibernate therein. The two sexes are very alike, but the males may be distinguished from the females by the greater development of the webbing between the toes.

In regard to the edible frog there appears to be some doubt as to whether it is indigenous to this country or not, some naturalists being of the opinion that its presence in the British Isles is due to its having been introduced by mankind from the Continent. Be that as it may, however, the creature has now established itself in certain parts of the country and, although by no means plentiful, is to be found in Cambridgeshire and Norfolk, being somewhat rare, however, in the former district.

It is far more aquatic than the common frog, from which it may readily be distinguished by its superior size and by the absence of the dark-coloured streak extending from behind the eyes, along the sides of the head, that is such a characteristic feature of the latter creature.

The edible frog receives its name from the

fact that it is eaten by the populace of many European countries, a fate which also falls to the lot of the common frog on the Continent, although the flesh of the latter is stated to be very inferior to that of the former.

It appears that there are several recognized ways of catching the edible frog, the more sportsmanlike method being to "fish" for it with a line and hook baited with a piece of red cloth. Should, however, the frog-hunter be more concerned about the quantity of his catch than for his reputation as a sportsman, he will probably employ a drag net or search for them at night with the aid of a bull's-eye lantern, the rays from which dazzle the frogs and render them an easy prey.

Yet another method employed is to run the water off a small pond, and then secure any of the creatures that may happen to be there before they have recovered from their surprise at being left high and dry.

It is only the hind legs of the frogs that are eaten, these dainties fetching about a penny or twopence each, according to size and quality.

Not many people will have much difficulty in distinguishing the common toad from the

frog, the skin of the former being studded with numerous warts. Moreover, the manner in which it progresses upon land is quite unlike that of the frog, for whereas the latter moves along in a series of leaps the toad usually does so by a curious crawling walk. It is by far the most intelligent of the batrachians, and not only will it become quite tame, but it will learn to recognize a human being who regularly feeds it. Its food consists of insects and worms, but in order to excite its appetite these must be on the move.

Owing to the fact that it has no teeth the creature sometimes has some difficulty in swallowing an extra large worm. But it usually succeeds in getting the better of its prey, pushing the protruding and wriggling ends of the worm into its mouth with the aid of its hands.

The last of the British tailless batrachians to be mentioned is the natterjack toad, a somewhat small species measuring barely two inches in length. It is by no means common, and very local in distribution.

Its hind legs are so short that the creature is unable to jump, nevertheless it is able to get along with considerable speed by running with its body raised up from the ground. Further distinguishing features of this toad

are the narrow yellow line along the middle of its back and the pale-yellow tint of its eyes.

Unlike the majority of toads the natterjack delights in dry situations, and will frequently sit out and bask in the sunshine. Only during the spawning season does it make its habitation near the water. The creature is said to possess the peculiar power of giving forth a smell resembling that produced by the smoke of gunpowder.

Although many instances have been reported of frogs and toads falling in showers from the sky, yet this remarkable phenomenon may be likened unto the stories of adders swallowing their young alive, and of toads living for ages when buried in a piece of rock, accounts of which crop up from time to time, and are vouched for by persons who have no wish to deceive and are firmly convinced of the truth of their statements. Whether such stories will eventually die a natural death is difficult to say, but at the present time no evidence of a sufficiently convincing nature of these happenings has been forthcoming to satisfy the doubts of the world's leading naturalists.

Not long ago it was reported in the daily Press that millions of tiny frogs were rained

down from the clouds at Gibraltar, and, of course, the story at once aroused the usual amount of controversy as to the possibility of such a thing happening. The usual explanation put forward by those who are against accepting such reports as being true is that a sudden shower had awakened to activity numbers of small frogs that had but lately been transformed from the tadpole stage and were hiding under stones or in crevices in order to shelter from the heat of the sun. Although this solution of the mystery would appear to be a perfectly satisfactory one, yet the following letter published a short time back in the pages of a daily paper at once sets the ball rolling again, for the writer states: "In the summer of 1875 when going down the Ottawa River, Canada, with passengers for Montreal, a violent thunderstorm with torrents of rain burst upon us about 6.30 p.m.; with the rain came thousands of tiny frogs, which covered the promenade deck. So much so that I ordered some of the deck hands up with a shovel to clear them away. Where they came from none of us could imagine as at the spot dense forest covered both sides of the river."

As promenade decks can hardly be regarded as suitable hiding-places for frogs, we must

be content to let the believers and unbelievers continue the controversy and hope that in time a solution satisfactory to all parties will be found.

CHAPTER IX

LUMINOUS ANIMALS

NATURE has bestowed upon the various members of the Animal Kingdom many remarkable gifts, but possibly the most wonderful of all is the power to emit light. This light-giving property, or phosphorescence as it is commonly called, is more general among marine creatures than among terrestrial ones, while in the case of the latter the phenomenon is chiefly displayed by insects, although some of the earthworms are also of a luminous nature. None of the land vertebrates, however, is endowed with the power to give forth light.

One of the most beautiful effects produced by the light-bearing creatures is that known as the phosphorescence of the sea, a sight that can be witnessed on favourable occasions in the waters that wash our shores, although it is in foreign climes that the display is to be seen to its greatest advantage.

The living creature that commonly, but not

exclusively, causes the phosphorescence of the sea is a form of life known as *Noctiluca miliaris*, a minute, spherical and jelly-like mass measuring about a thirtieth of an inch in diameter, upon the surface of which are numerous vein-like markings. It is only met with in waters adjacent to the shore, and calm, dark nights during the summer and autumn months are the most favourable times to observe its light, for should the sea be rough the tiny creatures get driven below the surface and become too scattered to produce much illumination.

The intensity of the light emitted by these animals is so great that a glass full of them will produce sufficient illumination to enable a person to read at a distance of two feet away.

Mr. F. T. Bullen gives an interesting account of the luminosity of the sea as witnessed by him during a voyage in the neighbourhood of the Philippine Islands. He states that the light produced was so intense that the stars looked merely like white points against a black sky, while the tracks of fishes were revealed by streaks of fire-like intensity, and the ship upon which he was journeying was encircled with bright light as the waves broke against the hull of the vessel.

Darwin also tells us that: "When sailing

a little south of the Plata on one very dark night, the sea presented a wonderful and most beautiful spectacle. There was a fresh breeze, and every part of the surface, which during the day is seen as foam, now glowed with a pale light.

"The vessel drove before her bows two billows of liquid phosphorus, and in her wake she was followed by a milky train. As far as the eye reached, the crest of every wave was bright, and the sky above the horizon, from the reflected glare of these livid flames, was not so utterly obscure as over the vault of the heavens."

It is also recorded that the captain of an American ship sailed through a zone of phosphorescent sea in the Indian Ocean for a distance of nearly thirty miles; while Humboldt records the fact that, having bathed in the sea where a number of *Noctiluca* were present, his body glowed with light for an hour after he had left the water.

At one time it was thought that a phosphorescent state of the sea was due to the water giving out light that it had absorbed and stored up during the daytime; while another theory was that the rotation of the earth set up friction between the air and the sea, thereby producing the light.

Not until the year 1750 was the true cause discovered.

Of the various kinds of luminous fish, one of the most remarkable is *Aethoprora effulgens*, a deep-sea species that inhabits tropical waters at a depth of ten thousand feet. This finny light-bearer is endowed with quite an array of luminous points, the principal one being situated on the snout, and acting as a veritable "head-light." A closely-set row of minor lights is also present along the body on either side, and beneath these are others that look as if they were arranged in hanging loops from those above.

Another species, the black astronesthes, found only in the Atlantic, has a double row of luminous spots along the body, while, moreover, it is also curious in the fact that it possesses two dorsal fins, one of which is composed entirely of fat. Little is known of the habits of this fish, and, according to Mr. Bullen, only half a dozen of them have ever been captured.

One of these was taken from the stomach of a halibut that had been captured eighteen thousand feet below the level of the sea.

Coccia ovata, another luminous fish, has twenty-five small, pearl-coloured and light-emitting disks upon its body, each one being

situated upon a black globular prominence; but even better endowed is the pearl-side (*Maurolicus borealis*), a small fish found in British waters, which has about forty-six pearly spots on either side of its body, these being set in depressions in the skin, and surrounded by a narrow black ring.

The moon-fish or sun-fish, a species occasionally visiting British seas, and quite common in the Mediterranean, is also endowed with the power to radiate light. Mr. Holder tells us that at night "they present a remarkable appearance, moving along like gigantic globes of light, or resembling the reflection of the moon upon the water. When numbers of them swim together, the huge dorsal cutting the water, that breaks itself into ripples of molten silver, the scene is described as being magnificent in the extreme."

In the majority of the light-bearing fish the luminosity they emit is produced by a mucus secreted by glandular organs which may be present upon the head, along the sides of the body and tail, or even on the back. In some species, however, in which these organs are absent, the light is transmitted through lens-like plates that lie in front of closed receptacles filled with a clear liquid substance. These phosphorescent plates may

be present either below the eyes or on the body.

Luminosity among the crustaceans is fairly common. Some of the deep-sea crabs possess phosphorescent eyes, the tips of which shine like balls of fire. A South American species (*Cancer fulgens*), discovered by Sir Joseph Banks, is so luminous that, according to Mr. Holder: "Its entire surface seemed bathed with a white flame, that flashed and sparkled like living fire, and so resembled it that later one of the sailors picked the crab up, thinking it a coal that had rolled out of the galley fire."

Certain species of shrimps and prawns are endowed with the power to emit light, several of them being found in British waters. In some kinds the light-producing organs are situated at the base of the antennæ, while in others a large number of luminous points are distributed all over the body. One species (*Nyctiphanes norvegica*), found around the coasts of Great Britain, possesses light-giving organs situated upon the thorax and abdomen, and if some of these creatures be put in a glass bowl full of water in a darkened room, they appear like flashes of light as they dart about from side to side of the vessel.

Another tiny crustacean, called *Metridia*

armata, is responsible for producing very beautiful effects amidst the Arctic snow where it dwells.

Nordenskiöld writes in reference to this creature: "If during winter one walks along the beach on the snow, which at ebb is dry, but at flood is more or less drenched through with sea water, there rises at every step an exceedingly intense, beautiful bluish-white flash of light. . . .

"The flash lasts only a few moments, but is so intense that it appears as if a sea of fire would open at every step a man takes.

"It produces indeed a peculiar impression on dark and stormy winter days to walk along this mixture of snow and flame, which at every step one takes splashes about in all directions, shining with a light so intense that one is ready to fear that his shoes or clothes will take fire."

Phosphorescence is also emitted by the Tunnicates, the phenomenon being especially marked in the genus *Pyrosoma*, small creatures which congregate together in large numbers and form bunches. The colonies sometimes attain to large dimensions, Moseley, during the famous voyage of the *Challenger*, recording one that measured four feet in length and ten inches in diameter. Describing this

interesting colony, he states: "When a *Pyrosoma* is stimulated by having its surface touched, the phosphorescent light breaks out at first at the point stimulated, and then spreads over the surface of the colony as the stimulus is transmitted to the surrounding animals. I wrote my name with my finger on the surface of the giant *Pyrosoma*, as it lay on deck in a tub at night, and my name came out in a few seconds in letters of fire."

Mr. Bennet also tells us that on one occasion, when journeying in the Australian seas, he passed through an expanse of luminous water which he judged to be a mile in breadth.

Casting a towing-net over the stern of the ship in order to investigate the cause of the illumination, he found that it was due to enormous numbers of *Pyrosoma* which gave forth a pale, greenish light.

Many of the corals emit a bright light. Darwin, in reference to a species found on the coast of Bahia Blanca, tells us that: "Having kept a large tuft of it in a basin of salt water, when it was dark I found that as often as I rubbed any part of the branch, the whole became strongly phosphorescent with a green light: I do not think I ever saw any object more beautifully so. But the remarkable circumstance was that the flashes of light

always proceeded up the branches, from the base towards the extremities."

Some of the sea anemones are luminous, and the little boring-shell, the Piddock (*Pholas*), also displays a light of a bluish tint. Pliny, who was the first to notice the phenomenon in the latter, states: "Those who eat the *Pholades* in an uncooked state . . . would appear in the dark as if they had swallowed phosphorus; and the fisherman who, in a spirit of economy, supped on this mollusc in the dark would give to his little ones the spectacle of a fire-eater on a small scale." Mr. Holder also tells us that "a single pholas has been found to render seven ounces of milk so luminous that faces of persons could be distinguished by it. . . .

"The best result was obtained by placing the dead mollusc in honey, by which its property of emitting light lasted more than a year. . . ."

Several species of worms, both terrestrial and marine, are capable of giving forth light. The remarkable-looking *Chætopterus*, some of which are found off the coast of Normandy and in the Mediterranean, are light-bearers, the phosphoric matter, according to Mr. Lydekker, "spreading like a cloud in the water."

The worm known as *Polycirrus* also emits

a bluish light from all over its body, and the scale-back (*Polynoe*) gives forth a greenish light where the elytra or scales upon the back join the body.

Yet another light-bearer is the phosphorescent sea-pen (*Pennatula phosphorea*), found in the Mediterranean and the Atlantic. This curious creature grows to a foot or more in length, and consists of what may roughly be termed a main stem from the upper part of which arise leaf-like appendages. The lower portion of the stem is somewhat like an elongated onion in form, and the general outline of the creature suggests a closed feather-fan. When disturbed it emits flashes of light, the intensity of which varies according to the amount of irritation to which it is subjected.

Not a few of the centipedes are of a luminous nature, the creatures producing light by the agency of a phosphorescent fluid yielded by glands opening upon the body.

One of the best known of the luminous animals found in this country is the glow-worm, a creature that, in spite of its name, is not a worm but a beetle. The sexes differ considerably the one from the other, the male possessing wings and the female being without those members.

Indeed, so greatly do the latter resemble

the larvæ or grub stage of the species that it is at first somewhat difficult to distinguish the two, but if a close examination be made it will be found that the adult female has the legs more developed than in the case of the grub.

Glow-worms are luminous throughout all stages of their existence. Even the eggs emit a subdued light, and both the larval and chrysalis forms glow in the dark, but the greatest degree of luminosity is displayed by the mature female.

In the case of the adults the light-giving organs are confined to two or three of the abdominal segments of the body, but the exact manner in which the light is produced still remains somewhat of a mystery, although it is known to arise from a yellowish and pulpy tissue, composed of numerous granules of an albuminous nature that lie beneath transparent plates. Glow-worms feed upon slugs and snails, and for this reason they are very beneficial to agriculturists.

In a similar manner to the glow-worm the fire-flies have a misnomer applied to them, for they are not flies but winged beetles.

There are a large number of different kinds of fire-flies, most of which come from tropical America, although some are found in the

West Indies. All of them emit light, the various species, however, differing in the degree of illumination they give forth, as well as in their manner of displaying it. In some of them the light emanates from the membrane-like joints of the segments in the region of the thorax, but in the majority the luminosity arises from two circular and slightly raised yellow spots situated upon the prothorax or region behind the head. The outer covering of the spots or "lanterns" is of a semi-transparent and horny nature, and beneath each of these covers lies a little cell or vesicle containing a phosphorescent substance. The light emitted from the spots is of a yellowish-green tint, but, when flying, the creatures also produce a reddish and somewhat diffused light from the abdomen.

In South America fire-flies are made use of by ladies as ornaments, the living creatures being fastened to the hair or dresses as if they were jewels. The natives catch the beetles by whirling about a glowing piece of charcoal after dark, the light of which attracts the creatures so that they fall an easy prey.

They are then placed in small cages, and fed with sugar-cane, to await purchasers.

The lantern-fly is said to be another light-bearer, although it must be mentioned that

many naturalists are inclined to doubt the veracity of the statement for lack of conclusive evidence. According to some writers, however, it has four luminous spots upon its body, two on the upper surface and two on the lower, the former giving forth a purple light and the latter a green one.

CHAPTER X

SQUIDS, CUTTLE-FISH, AND THEIR ALLIES

THE large group of soft-bodied and back-boneless animals called molluscs is divided into numerous sub-divisions or classes, that known as the *Cephalopoda*—a term derived from the Greek words *kephale* (a head) and *pous* (a foot), and referring to the fact that the arms or tentacles of the creatures included in that division arise from the front of the head and are situated around the mouth—comprising squids, the cuttle-fish, the argonaut and the octopods.

The cephalopods are exclusively marine dwellers and, with the exception of the argonaut, have no external shell. As a means of support to their soft and flexible bodies, however, they are provided with an internal shell of varying size and shape.

Many of the creatures attain to enormous dimensions, and the under surface of their arms is furnished with numerous disk-like suckers.

Not all of the cephalopods have the same number of limbs, some of them possessing eight and others ten; those that have the smaller number being called *octopods* and the others being termed *decapods.*

Although the animals utilize their arms as organs of locomotion for walking upon, they also progress by expelling water through a curious membranous tube, connected with the gill chamber, known as the "funnel" or "siphon."

This organ can be turned to the right or left, thereby enabling the creatures to guide themselves, while their speed can be regulated by controlling the force of the water expelled through the siphon. The animals walk with their head downwards, and when making use of their siphon they shoot through the water backwards

One of the most familiar of the cephalopods is the octopus, of which there are about ninety known species found in various parts of the world, some of them inhabiting the seas around our coasts.

Many sensational stories have been written about these creatures, and the size to which they grow has been subject to much exaggeration.

The largest individuals do not possess ten-

tacles of more than six feet in length, but their strength is prodigious, and their grasping power so great that it is impossible to make one release its hold of an object when once it has obtained a firm grasp, without severing its limbs. Indeed, it is the grasping and adhesive nature of the tentacles that renders the octopus such an objectionable and dangerous creature to meet, and those of us who have experienced the sensation of having water weeds or seaweed encircling our limbs when bathing can well imagine that it would be by no means pleasant to come across even a small octopus in similar circumstances.

Mr. Frank T. Bullen gives an interesting account of his experience in reference to one of these creatures. When engaged in catching flounders and wading knee-deep in water, he suddenly felt a prickling sensation upon his leg. Looking down to discover the cause of his discomfort he found that a small octopus, with a body not much larger than his fist, had attached itself to his leg and was gradually creeping upwards. Endeavouring to rid himself of the repulsive-looking object, he seized hold of the arms one by one, and forcibly pulled them from off his limb; but this had little effect beyond tearing his flesh, for no sooner had he removed one tentacle than

others crept upwards and attached themselves to his person. As a last resource he drew his sheath knife, cut off the arms as near to their base as possible, and by this means liberated himself from the unwelcome intruder.

The octopus spends most of the daytime hiding beneath a rock, or with its body squeezed into a crevice; but at dusk it comes forth in search of its prey which consists principally of crabs, whelks, oysters and lobsters. Such fare may appear at first sight to be somewhat tough morsels for the creature to dine upon, but as it is endowed with a pair of powerful and horny mandibles that greatly resemble the beak of a parrot, it is able to crack the shells of its victims with ease and then feed upon their softer parts.

The animal has many enemies to contend with, for not only is its flesh considered a dainty by mankind, but practically all the members of the finny tribe find it a toothsome morsel. Of the latter the conger eel is accounted its most formidable foe in British waters, while among its mammalian foes the whales are ever ready to receive it with open jaws.

Notwithstanding the enormous numbers of octopods that fall victims to the appetite of the denizens of the sea, the creatures continue

to thrive and multiply at an enormous rate, for each female produces about fifty thousand eggs during the two or three days she is laying. The eggs are quite small and measure about an eighth of an inch in length, each one being fixed along and around a central stalk, like grapes growing in a bunch.

The clusters sometimes attain to a length of five inches, and as many as fifty of these may be produced by a single female, the size and number of the clusters, however, depending upon the age of the animal responsible for their production.

From observations made of one of these creatures kept in captivity, it appears that the mother watches vigilantly over her eggs during the period of about fifty days they take to hatch out; from time to time gathering them towards herself and rubbing them gently with her tentacles. She also occasionally directs a jet of water over them through the agency of her siphon or funnel, this being done to rid the ova from minute parasitic animalcules that are present in the water.

The newly-hatched octopus is about the size of a flea, and its arms are at first little more than cone-like excrescences.

The male and female octopus are very similar in appearance, but during the breeding

season the former develops a curious swelling upon his third right arm. From this swelling arises a worm-like growth that terminates in a long and slender filament.

Mr. Edgar E. Smith, writing in the *Royal Natural History*, tells us that when the owner of this peculiar arm "offers his hand to a female octopus, she not only accepts it, but keeps it, for this remarkable outgrowth is then detached from the arm of her suitor and becomes a moving creature, having separate life, and continuing to exist for some time after being transferred to her keeping."

Another interesting member of the eight-armed cephalopods is the argonaut or paper-nautilus, a creature that has given rise to many fabulous stories concerning its supposed habit of floating upon the surface of the ocean in its shell, and utilizing its arms as sails. As, however, further reference will be found in these pages to this poetical fallacy, we will proceed to consider other matters in regard to this wonderful animal.

It is the sole member of the octopod group that has an external shell, although, curiously enough, it is only the females that possess one. The creature receives its name of "paper" nautilus on account of the extreme delicacy of its shell, which is so thin and fragile that

should one be cast up on the shore it is broken at once by the action of the waves.

This shell, which is of the coiled type and decorated with transverse ridges, is made entirely by the female through the agency of a secretion she exudes from two large and flattened lobes, one of which is situated on the end of each of her two longest arms. The mantle or outer skin which invests the creature's body, however, also assists in the shell-forming process. The argonaut can fashion and complete its shell in a very short period, and the manner in which she goes to work when thus employed is graphically told by Professor Holder, who was fortunate enough to be able to observe a captive specimen in the act of building its home.

In describing this interesting event, he writes: "Resting upon the bottom of the tank, it held its two shell-secreting arms above, side by side, in point of fact, they were joined at the base. Then from the glands oozed the shell-making secretion, and it soon appeared as a gelatinous cast of each tentacle, the exact size of the shell the animal had been inhabiting. The radiations on the face of the tentacles made the radiations on the shell, and one could imagine that gelatine had been pressed into the moulds and allowed to harden. I

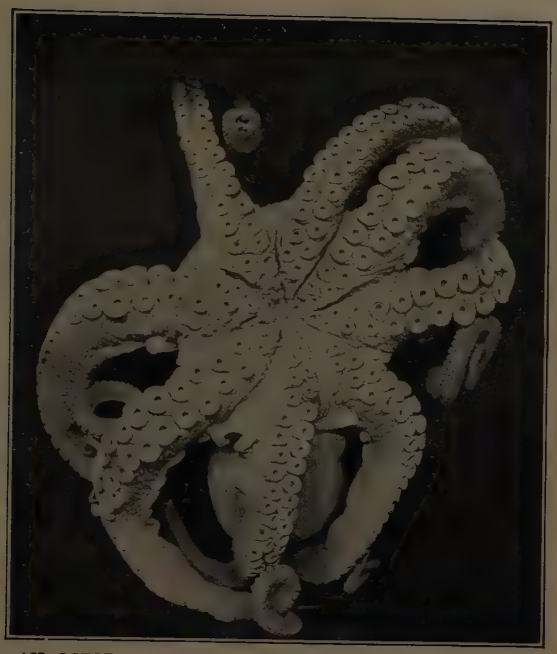
watched the radiant creature all day and late into the night, and the following morning part of the new shell was found, a delicate, tenuous mass, that would gradually harden. Hence I believe that a new and large shell can be produced in a few hours."

The female argonaut is not organically attached to her shell in the manner of an oyster or a mussel, but merely rests inside and retains herself in position by clasping the outer sides of the domicile with the large flattened lobes of her specialized arms.

A dweller in rather deep water, and only occasionally coming to the surface, few people have had the opportunity of seeing one of the creatures otherwise than within spirit-filled bottles in museums. The latter, however, give little idea of the wonders of the living animal, whose ever-changing tints of lavender, blue, scarlet, rose and gold render it an object of exquisite beauty.

It progresses in a similar way to the octopus, crawling along the ground by means of its ordinary arms, and propelling itself backwards by ejecting water through its funnel.

Passing to the decapods, which include the squids or calmaries, the cuttle-fish or sepia, and the sepiola, we come to a group of the cephalopoda that differs from the octopods



AN OCTOPUS, SHOWING THE SUCKERS ON ITS ARMS.
See p. 154.

THE ARGONAUT OR PAPER-NAUTILUS.
See p. 158.

A SQUID OR SEA-PEN.

See p. 160.

THE CUTTLE-FISH OR SEPIA.

See p. 165.

by having ten arms, the additional pair being of unusual length and only having suckers at their extremities.

In some instances the arms are completely retractile, in others but partly so, while, yet again, they may be non-retractile. They serve their owners as prehensile organs by means of which they can affix themselves to objects, and also as lasso-like weapons for seizing their prey.

All of the creatures possess an internal shell, that of the cuttle-fish, known commercially as "cuttle-bone," being of a bony nature, broad and flat, and of considerable size in relation to the body of the owner; but in the squids the structure, called the "pen," is horny and very slender.

The latter, several of which may be present in old individuals arranged the one behind the other, resembles a quill pen in form, the stem being enlarged at one end and forming an oval-shaped and flat expansion that is vaned like a feather. As the creatures are in the habit of ejecting a dark-coloured fluid from their siphon for the purpose of rendering opaque the water in which they are swimming, thereby enabling them to escape from their enemies, they are frequently spoken of as "pen-and-ink" fish.

Of the various species of squids, that known as *Loligo vulgaris* is found in British waters, more especially around the Cornish coast. It also inhabits the Mediterranean and the Atlantic. The animal has many foes, among which are to be numbered the albatross and other sea-birds, the sperm whale, and different kinds of dolphins. Fishermen, moreover, capture large quantities of them at night by torchlight—the creatures being attracted by the light—and use them as bait. The squid, however, is of a very prolific nature, a solitary female producing as many as forty thousand eggs during the months of May and June, so that the species does not appear to suffer any great diminution in consequence of its persecution.

The spawn is very curious in appearance, being enclosed in semi-transparent and gelatinous sheaths measuring about four inches in length, numbers of which are attached together and radiate from a common centre. These clusters, which float upon the surface of the ocean, are known as "sea-mops."

Other interesting members of the squid family are the flying-squids (*Omnastrephes*), so called on account of their habit of leaping out of the water. When thus engaged they not infrequently fall upon the decks of passing

vessels. They differ from the *Loligo* by reason of their longer and more slender bodies, shorter posterior fins, and the extreme slenderness of the pen.

Then we have a small species known as the sepiola, a dwarf of its kind whose body only measures about an inch in length.

It is sometimes caught in shrimp nets off our Southern coast, and is quite common in the Mediterranean, being offered for sale as food in the Italian fish-markets. The habits of the creature are very curious, for it buries itself beneath the sand up to the level of its eyes.

When making its hiding-place it squirts jets of water upon the sand through its funnel, until a cavity has been produced of sufficient size to enable it to sit inside. The shifting sand then quickly settles around it, so that only its head, eyes and arms are visible above the surface.

That some squids attain to enormous dimensions is proved by the records of many writers. In 1874 a specimen was captured in Logie Bay, Newfoundland, whose tentacular arms were twenty-four feet in length, the shorter or sessile arms measuring six feet. These measurements, however, were exceeded by another individual which was washed ashore

upon the Atlantic beach of Florida, near Saint Augustine, one arm (the only remaining one) attaining to a length of forty feet. It was estimated that the full stretch of this creature when alive would have been one hundred feet or more.

An interesting account of a gigantic squid is published in the *Proceedings of the Zoological Society*, from which we take the following extract: "Two fishermen, when plying their vocation off Belle Island, Conception Bay, suddenly discovered, at a short distance from them, a dark shapeless mass floating upon the surface of the water. Concluding that it was probably part of a cargo of some wrecked vessel, they approached, anticipating a valuable prize, and one of them struck the object with his boat-hook. Upon receiving the shock the dark heap became suddenly animated. . . . The men were petrified with terror, and for a moment so fascinated by the horrible sight as to be powerless to stir. Before they had time to recover their presence of mind, the monster, now but a few feet from the boat, suddenly shot out from around its head several long arms of corpse-like fleshiness, grappling with them for the boat and seeking to envelop it in their folds. Only two of these reached the craft and, owing to their length, went com-

pletely over and beyond it. Seizing his hatchet . . . one of the men succeeded in severing these limbs . . . and the creature, finding itself worsted, immediately disappeared beneath the water."

The portion of each severed arm proved to be nineteen feet in length, and it was estimated that at least another six feet of each limb remained attached to the creature's body.

Possibly the best known of all the decapods, by name, at all events, if not in the flesh, is the cuttle-fish or sepia, for not only does it supply the "cuttle-bone" that we hang up in the cages of small birds, a commodity that was also used in a pulverized and burned state by the Roman ladies in olden days as a face-powder, but it also yields the dark-brown pigment known as sepia. The crystal-like lenses of the creature's eyes, moreover, were formerly worn by the Genoese women on festival days as beads, the internal surfaces giving forth beautiful opal-like colours. We also read that the ancient Peruvians utilized these lenses as ornaments, and in the British Museum there are several large specimens that were found in the eyes of some Peruvian mummies. Furthermore, it is stated that the inhabitants of the Sandwich Islands

went so far as to dispose of them as pearls.

A fully-grown cuttle-fish measures about ten inches in length and six inches in breadth, while its ordinary or sessile arms are about five inches long, and its tentacular ones eighteen inches, the latter being entirely retractile within the creature's head. The animal appears to resort to the practice of discharging its "ink" much more freely than other cephalopods, and the quantity of the fluid it is able to secrete is also much greater. Although it is found around the British shores, as well as in many other parts of the world, yet, probably, few of us have ever seen a living example.

Possibly, however, we may have come across their eggs, even without being aware of the fact, for these are frequently washed up upon the shore after a storm.

They look exactly like black grapes, and feel as if they were made of india-rubber, every one having a flexible stalk, and a number of them being fastened together in a bunch, attached to a piece of seaweed.

Each of these grape-like capsules contains a single young one which, when first born, is about the size of a sixpence.

It is possible to remove the baby prema-

turely from its egg by breaking asunder the investing skin and liberating the occupant, and even at such an innocent age it will squirt ink over one's fingers in an endeavour to escape from its captor.

CHAPTER XI

SNAILS AND SLUGS

THE term "snail" is applied to a number of different creatures belonging to a class known in zoological nomenclature as *Gastropods* —from *gaster*, "belly," and *pous*, "foot," and referring to the fact that the creatures creep along by expanding and contracting the under-part of their body or "foot."

From a popular point of view, however, the name is usually employed to describe only those members that possess a shell within which the animals retract their bodies, but as some of the gastropods are unprovided with such a form of protection—a well-known example being the black slug (*Arion empiricorum*)—it will be seen that the distinction is not altogether a correct one.

In the early state of their existence, all snails are provided with a shell, but as they grow up this may disappear, or may become hidden beneath their flesh in the form of a small, flattened and elongated plate.

The creatures are found in all parts of the world, even in desert regions and at high altitudes up to an elevation of ten thousand feet. Some are terrestrial in habits; others, such as the whelks, the periwinkles and limpets, dwell in the sea, and others are found in fresh waters. They appear to possess great tenacity of life, for they can exist without partaking of food for a considerable length of time.

The land snails, although habitually undertaking long fasts—those dwelling in cold countries burying themselves beneath the ground during the winter, and those that live in hot climates passing through a torpid state during the hottest and driest months of the year—sometimes extend the normal period of abstinence, and have been known to live for four or five years without food.

In regard to their external appearance, the shells of snails display great diversity of colouring, some being brown, some yellow, and others pink or lilac, the ground tints frequently being decorated with dark-coloured bands. In the case of the wood-snail (*Helix nemoralis*), the variations of its shell are so great that no less than eighty-nine different kinds of markings have been recorded in British specimens alone.

All snails originate from eggs which, in the majority of cases, are laid in the form of jelly-like globules by the female. Sometimes, however, the eggs are hatched before they see the light of day, the young being born in a fully developed state.

The number of eggs laid by different species of snails is also very variable, the marine forms producing many more than the terrestrial ones.

The well-known sea-snail or whelk deposits its eggs in a mass of capsules, of which there may be as many as six hundred, each one containing several hundred eggs. On the other hand, the giant snails (*Achatina*) lay only a few eggs during a season, but these are of enormous dimensions, almost equalling those of a thrush in size, and possessing a hard, brittle and whitish shell. It is of interest to note that the albuminous or "white" matter in these eggs is frequently employed for the purpose of repairing broken glass or china.

Although we all know the common garden-snail (*Helix aspersa*) by sight, yet in all probability our acquaintance with it is only of a very casual nature, the creature usually being crushed underfoot at sight, or else, in the case of the more humane ones among us, being furtively lobbed over the garden fence to browse upon

the herbage in our neighbour's garden. If, however, we were to stop and examine one of these creatures more closely, we should find that it exhibited many interesting features. Its head, for instance, is furnished with two pairs of tentacles or "horns," the eyes being situated upon the extremities of the hindermost and longer ones. The greater part of its body is permanently enclosed within the shell, but when the animal is progressing it protrudes an organ known as the "foot," which tapers behind and is furnished with a mucous gland that secretes the slimy trail that marks its passage as it crawls along.

All snails are provided with a so-called "tongue" or lingual ribbon that is fixed to the floor of the mouth, the under surface or "radula" being covered with a multitude of small and pointed tooth-like excrescences that are coated with a hard substance called chitin. These teeth, which are arranged in a series of rows and are capable of being erected at the will of the owner, vary considerably in number in the different species of the snail family, the common garden-snail possessing about one thousand five hundred, while the great black slug has as many as thirty thousand.

When feeding, the animals pass their tongues backwards and forwards over their food, the

sharp projections acting as a rasp and breaking the food up into small particles. As the teeth become worn by constant use, they are replaced by others which are continually forming at the basal end of the tongue-ribbon, and pushing their way forward.

The teeth of whelks, although fewer in number than in the land snails, are larger and more powerful; being especially adapted for boring holes through the shells of mussels and oysters, thereby enabling them to reach and feed upon the soft parts of their victims.

That snails are endowed with a considerable degree of strength has been proved by experiments carried out especially with a view to test their muscular power. On one occasion two garden-snails were "harnessed" by narrow pieces of tape to a toy gun-carriage made of lead, and not only did the novel steeds succeed in pulling along their burden with ease, but they also made equal progress when the gun-carriage was filled with shot. To try their powers even further, a small brass cannon was then attached to the gun-carriage, and although the combined weight of the load amounted to fifteen ounces, the snails continued on their course without difficulty.

This achievement, however, was surpassed by the efforts of another pair of snails which

succeeded in drawing along a toy waggon with a kilogramme weight (over two pounds) placed upon the top; while a further record was made by a snail that moved a load of over three pounds, the experimenter stating that this was accomplished after only four days' training.

In case any of my readers may feel inclined to set up a stable of these mettlesome steeds, a few words of advice in regard to the manner of harnessing them may be of service, the result of the experiments depending a great deal upon how this is carried out. Narrow tape or, better still, strong thread should be used for the traces, one end being fastened to the carriage, while the other should be attached to another short thread, the two extremities of which are fixed on either side of the creature's shell by means of wax or plaster. It is important, however, that the harness be set at a proper height so that the snail is enabled to obtain a straight pull, and thus avoid being lifted upwards during its progress.

To those who are ambitious to own and drive a "four-in-hand," it may be pointed out that some difficulty may arise from the fact that the steeds cannot be guaranteed to *step out together* or to pull evenly. But this drawback may be overcome by fixing a short length of

elastic to either end of the traces, thereby keeping them taut during the interval when the snails are extending themselves in preparation for their forward journey.

It is generally stated that a snail cannot live out of its shell, but, possibly, it would be more correct to say that it is almost, if not quite, impossible to remove one from its domicile without causing it fatal injury. Be that as it may, however, there can be no doubt that snails do not make a general practice of coming forth into the world in a naked and unprotected state, although the writer knew of one individual that did indulge in such a strange pastime. Notwithstanding that this snail was of the common or garden variety, it was quite uncommon in appearance, as a glance at our photograph of the creature will show, its shell, instead of being compactly coiled over its body, being extended into elongated and open spirals. Its habits, moreover, were in keeping with its curious appearance, for one day it was discovered crawling about its vivarium without the protection of its shell. It was promptly replaced within its proper quarters, where it remained for some time, but at length it came out once more and took another walk abroad. Whether it caught cold owing to its having gone out

without sufficient clothing the writer is unable to say, but, unfortunately, it only lived for a few days after indulging in this strange behaviour.

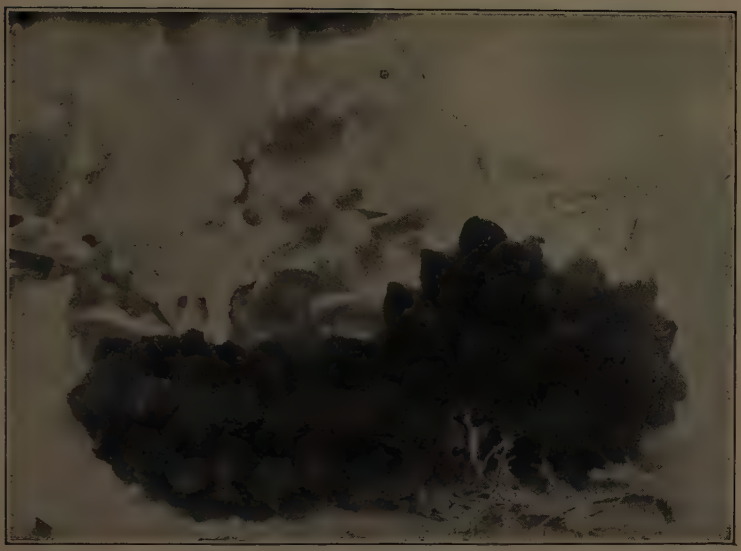
Another snail found in this country is the edible, vine or apple snail (*Helix pomatia*), as it is variously called. It should be pointed out, however, that its scientific name has nothing to do with the Latin word *pomum*, "an apple," but is derived from the Greek *poma*, "a lid," and refers to the fact that the snail closes up the opening of its shell during the winter months with a calcareous covering.

The term "apple" is given to the creature owing to the compact and rounded shape of its shell, while that of "vine" is employed because it is fed on vine leaves in those parts where it is specially fattened for human consumption. The snail is also spoken of as the Roman snail owing to the commonly received belief that the animal was introduced into this country by the Romans in order that they might continue to feast upon their favourite dish when they were away from their homeland.

Nowadays, however, this supposition does not receive credence by the majority of naturalists, and it has even been suggested that the snail was unknown to the Romans, the species

found in Central Italy being of another kind. Then, again, Mr. G. Jeffreys, in a letter to the *Field*, points out the significant fact that among the remains from a Roman villa in Northamptonshire where quantities of whelk, oyster, cockle and mussel shells were found, not one of the edible snail was among them, notwithstanding the fact that numbers of the living creatures were to be found in abundance at a distance of a few miles from the site. The complete absence of shells has also been noted at many other places in England where the Romans were known to have encamped or built their cities.

Edible snails are eaten extensively by the inhabitants of France, Spain and Italy, and are even appreciated by some people as an item of diet in this country; the creatures, for preference, being boiled in spring water, and afterwards seasoned with salt, pepper and oil, to taste. Mr. Cameron, in his book, *The Wild Foods of Great Britain*, states that in the South Cotswold country the demand for them is so great that their market price is invariably displayed outside the provision shops in the Gloucestershire town of Wotton-under-Edge; while another authority tells us that one hundred thousand edible snails are consumed every year in London alone, the creatures being largely



EGGS OF CUTTLE-FISH—THEY LOOK LIKE BLACK GRAPES AND FEEL LIKE INDIA-RUBBER.

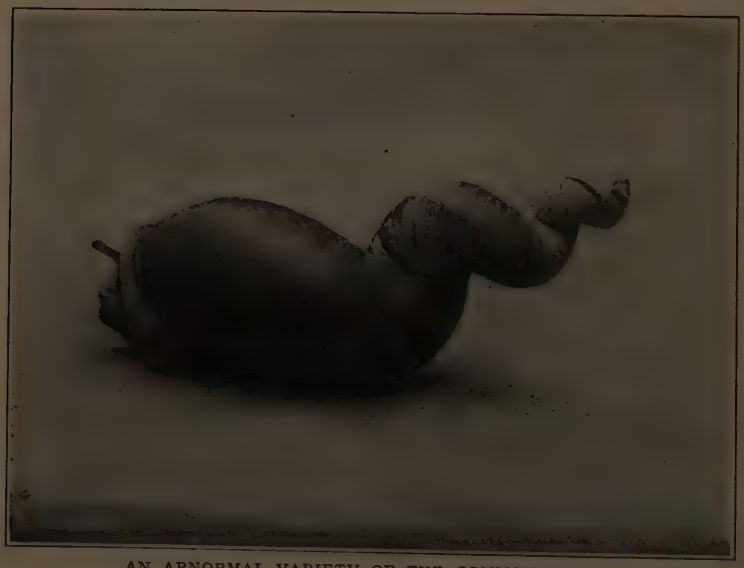
See p. 166.

EGG CAPSULES OF THE WHELK.

See p. 170.

A GIANT SNAIL AND ITS EGG.

See p. 170.



AN ABNORMAL VARIETY OF THE COMMON SNAIL.

See p. 174.

used for the purpose of giving a glaze to pastry, and as a thickening to soup.

The industry of rearing snails is one of considerable magnitude on the Continent, and it is reported that as many as eighty thousand of these dainties are fattened for the table at a single "farm" in Switzerland. During the season of Lent, the Parisians are stated to consume fifty tons of snails daily, largely owing to the fact that they are not regarded as "flesh or fowl" by the Roman Catholic Church. That such a rate of consumption has resulted in a shortage of snails is not to be wondered at, and we read that the local authorities of the Côte d'Or have proclaimed a close season between April 15 and July 15 every year, during which period it is illegal to capture the creatures that are under their jurisdiction.

The edible snail passes the winter underground, and, as previously stated, seals up the opening of its shell with a calcareous matter that serves to keep out the cold and damp. But unlike that of the majority of snails, this covering is not pierced with small breathing holes, although it is believed to be sufficiently porous to admit air. The eggs of the female, which are laid in June within the shelter of holes made in the earth, are about the size of a pea, of a jelly-like consistency, and greyish

in colour. Their incubation period varies from twenty to forty days, according to the degree of temperature they are subjected to; the young eventually eating their way through the enveloping skin and commencing a free existence.

Beyond forming an item of diet for human beings, snails are also appreciated by various kinds of birds. Sheep, moreover, are said to fatten on a small species of *Helix* which inhabits sandy districts in this country.

On the other hand, a small water snail (*Limnæa truncatula*) is responsible for spreading the dangerous disease known as "liver-fluke" among sheep, the liver-fluke itself being a flattened and leaf-like worm, about an inch in length, that passes the early state of its existence within the snail.

As the metamorphosis of the fluke proceeds, it eventually takes leave of its host, making its way out of the water and fixing itself upon a blade of grass. Should this grass be eaten by a sheep, the fluke continues to make a further transformation within the animal's stomach, finally finding its way to the liver of its new host and setting up the dreaded malady.

A well-known snail found inhabiting ponds and slow-running streams in this country is

the common pond snail, a species that is very useful as an inmate of an aquarium because it feeds upon rotting vegetation, thereby keeping the water from becoming stale. Although it spends much of its time crawling about in the usual snail-like fashion, it frequently comes to the surface to breathe, when it often floats in an inverted position.

Notwithstanding that the water snails are aquatic in habits, most of them will drown if submerged beneath the water for too long a time. This, however, does not apply to a water snail found in Madagascar, which possesses gills that enable it to extract the air held in the water.

The ramshorn snail and the viviparous pond snail are other species to be met with in this country, the former inhabiting stagnant pools and ditches, and the latter selecting the mud-bed for its habitation. The ramshorn snail, which has the curious habit of ejecting a purple-coloured fluid when alarmed, receives its name from the flattened and tightly-coiled nature of its shell; while the viviparous snail, as implied by its name, is so called on account of the fact that its young are brought forth in a fully developed state, instead of being hatched from eggs laid by the female.

Very curious are the amphibious snails or

bottle-shells (*Ampullaria*) that are found in the marsh districts of tropical countries, for not only can they exist equally as well in water as on dry land, but they are also provided with both lungs and gills which enable the creatures to indulge in a double means of respiration, namely, by extracting the oxygen held in the water, and by taking a supply direct from the atmosphere. Professor Semper states that they make use of their gills and lungs in regular alternation, "for a certain time they inhale air at the surface of the water, forming a hollow, elongated tube by incurving the margin of the mantle, so that the hollow surface is closed against the water and open only at the top. When they have sucked in a sufficient quantity of air, they reverse the margin of the mantle, opening the tube, into which the water streams." When living entirely out of water the creatures, of course, only make use of their lungs for breathing purposes. Like the edible snail, ampullaria is sometimes called the apple snail because of the globular nature of its shell. It can live for a long time out of water, some having been kept for several years out of that element.

Inhabiting Africa, Madagascar, New Caledonia and other adjacent islands are some enormous land snails that sometimes attain to a length

of seven and a half inches, to which previous mention has been made in reference to the large size of their eggs. Unlike the majority of snails which subsist upon fresh herbage, it appears that these giants, or some of them at all events, feed upon decaying vegetation. Mr. L. Harger, writing upon his observations of these snails, tells us that he could not remember ever having seen any feeding upon green or growing vegetation, but, on the other hand, when in Nyassaland, he observed them browsing upon that which was decayed, the leaves being sodden and having lost their green colour. It is also recorded that a specimen kept in confinement refused to partake of a vegetarian diet, but satisfied its appetite by eating another snail. In New Caledonia the French colonists eat these giant snails.

Snails have for long been regarded by many country-folk as possessing medicinal properties, the creatures being prepared in various ways, and administered to a patient both internally and externally.

Of the many recipes that have been handed down to us from the past, possibly the most curious and elaborate one was that favoured by the mother of General James Wolfe as a means of combating her son's lack of robust-

ness during his youth; particulars of which appeared in the pages of the *Observer*, as follows:

"Wash a peck of garden snails in beer, put them in an oven, and let them stay there till they have done crying; then prick the green from them with a fork, and beat them, shells and all, in a stone mortar. Take a quart of green earthworms, slice them through the middle, and stew them with salt; then wash and beat them, and place them in a pot in a still, with two handfuls of angelica, a quart of rosemary flowers, two handfuls each of agrimony, bear's-foot, red dock roots, barbery brake, biloney, wormwood, one handful of rue-tumeric, and one ounce of saffron."

The dose of this mixture was two tablespoonfuls at a time.

Before closing our remarks upon the typical snails, it may be of interest to mention a small species found in the Sandwich Islands that has the peculiar power of being able to emit musical sounds which have been likened by one writer to those produced by "hundreds of Æolian harps." Although it is not definitely known how these sounds are caused, it is generally assumed that the creature produces them by rubbing its shell against the bark of trees.

Passing to the slugs, a popular term applied to those members of the snail family in which the shell is usually absent or rudimentary, we come to a group that are mainly vegetarian feeders, although certain kinds partake freely of a carnivorous diet. All are endowed with a voracious appetite, as owners of gardens will know to their cost.

The largest slug found in Great Britain is the great grey slug (*Limax maximus*), a creature that attains to a length of six inches or more. It is found in damp situations, either out of doors or in cellars, and hides during the daytime, coming forth to feed at dusk. A parasitic mite is often found upon the body of this slug, and is believed to dwell within the respiratory cavity of its host.

Another species of the same genus as the foregoing is the milky slug (*Limax agrestis*), which receives its name from the peculiar milky colour of the mucus it exudes. It is found in abundance amidst strawberry beds, and causes much damage to the fruit. It also feeds upon earthworms. These slugs are very prolific and bring forth several families during the course of a year, the late Mr. Lydekker stating that "a single pair have been known

to lay nearly eight hundred eggs." When descending to the ground from a shrub or branch of a tree, some of the *Limacidæ* lower themselves by means of a slimy secretion at the end of the tail, the substance being discharged in the form of a long thread which quickly hardens upon exposure to the air, and enables the creature to support its weight thereby.

The black slug (*Arion empiricorum*) is another common species found in this country. In spite of its name, however, it is not always black in colour, for reddish, brown, yellow, green and white specimens are frequently to be met with, even in the same locality. It subsists chiefly upon vegetable matter, but has been known to eat earthworms and also the dead bodies of its own kind.

In the family *Testacellidæ*, or shelled slugs, we have a group in which the majority are provided with a shell. In many instances this covering is of sufficient size to enable the creatures to conceal themselves inside, but in others it is very small and situated upon the hinder end of the elongated body. The carnivorous slug (*Testacella halistidea*) burrows underground to a depth of several feet, pursuing the earthworms upon which it chiefly feeds,

although it will not hesitate to sup upon its brethren should the opportunity arise for it to do so. It is only at night-time that the creature ventures above ground.

CHAPTER XII

CONCERNING VULTURES

THERE can be little doubt that the majority of people regard vultures as loathsome and repulsive creatures, and although it is difficult to say much in favour of their general appearance and habits, yet it cannot be denied that they render a very important service to mankind by acting as scavengers and removing refuse and offal which, if left exposed to the sun's rays in a hot climate, would become a source of danger to the health of human beings in an incredibly short time. Indeed, the beneficial work of the birds in this respect is regarded as being so great that in some countries special laws have been passed to afford them protection.

Most vultures attain to a considerable size, and the condor claims the distinction of being the largest of all, its outspread wings measuring about nine feet from tip to tip.

Except in the case of the lammergeier or bearded-vulture, the head and neck of the

birds are bare, or merely covered with short down; a provision of Nature that enables them to indulge in their carrion-feeding habits without soiling or clogging their plumage. They are found in various parts of the world, but their distribution is mainly restricted to tropical and warm countries. Occasionally, however, they stray far from their usual haunts, the Egyptian vulture having been captured in England on two occasions, and once so far away as Norway; while a griffon vulture has been seen in Ireland.

Vultures may be divided into two well-defined groups, namely, the true or Old World vultures, and the American or New World vultures. These differ the one from the other in many respects. The voice of the latter, for instance, is merely a hiss and in no way comparable to the full-toned and loud notes that their Old World brethren are capable of uttering. The American vultures can also be distinguished by the character of their nostrils which have no internal partition between them, so that, when viewed from one side, it is possible to see right through them.

For long it was a matter of dispute as to how vultures discovered their food, and how it was they congregated in such vast numbers, and so rapidly, around a carcass or dying

animal. Some writers were of the opinion that the sense of smell guided them to their feast, but it is now recognized that it is their wonderful power of sight that brings them together, the phenomenon being aptly described by Longfellow in the following lines:

> "*Never stoops the soaring Vulture*
> *On his quarry in the desert,*
> *On the sick or wounded Bison,*
> *But another Vulture, watching*
> *From his high aerial look-out,*
> *Sees the downward plunge, and follows;*
> *And a third pursues the second,*
> *Coming from the invisible ether,*
> *First a speck, and then a Vulture,*
> *Till the air is dark with pinions!*"

Darwin confirms this fact in his writings upon the condor vulture, the author stating: "When an animal is killed in the country, it is well known that the condors, like other carrion-vultures, soon gain intelligence of it, and congregate in an inexplicable manner. In most cases, it must not be overlooked that the birds have discovered their prey, and have picked the skeleton clean, before the flesh is in the least degree tainted. Remembering the experiments of M. Andubon, on the little smelling powers of carrion-hawks, I tried . . . the following experiment: the condors were tied, each by a rope, in a long row at the bottom

of a wall, and, having folded up a piece of meat in white paper, I walked backwards and forwards carrying it in my hand at the distance of about three yards from them, but no notice whatever was taken. I then threw it on the ground, within one yard of an old male bird; he looked at it for a moment with attention, but then regarded it no more. With a stick I pushed it closer and closer, until at last he touched it with his beak, the paper was then instantly torn off with fury; at the same moment every bird in the long row began struggling and flapping its wings. Under the same circumstances it would have been quite impossible to have deceived a dog."

A somewhat similar experiment was made by another naturalist with a turkey-vulture or turkey-buzzard, pieces of putrid offal being hidden beneath some thin canvas, upon the upper surface of which some fresh meat was placed. The vulture quickly ate up the latter, but, notwithstanding that its beak and nostrils were within a fraction of an inch of the concealed offal, it failed to discover the food until a small hole was made in the canvas, thereby revealing it to the eye of the bird. The experiment was then repeated, but in spite of the fact that the vulture had just been shown where the offal had previously been hidden,

it again gave no sign of being aware of its presence.

Of the various species of Old World vultures, the lammergeier or bearded-vulture is one of the most interesting, if merely for the fact that it inhabits Europe, where it is found amidst the Italian Alps, in Spain, and the Caucasus.

In former days it was also met with in Switzerland, but is no longer to be seen in that country, the last one, according to report, having been found poisoned in the year 1887.

It is more eagle-like than any other vulture, and, as previously stated, differs from the typical forms by having its head and neck fully clothed with feathers. The tips of its wings and tail are very pointed, the feet are of a bluish-grey tint, while the eyes are curious on account of the iris being of a pale orange colour, and the surrounding part, corresponding to the "white" of a human eye, bright red. Its habits are also unlike those of other vultures, for instead of flying high in the air it sails along the sides of hills and mountains in search of its food, which consists of such varied items as land tortoises, small mammals and carrion. Bones, however, are regarded as a special dainty, and should these be too large to be swallowed whole, the bird carries them aloft and then lets them drop to the

rocks below, where they break to pieces. In reference to this habit, the bird is called *Quebranta-huesos* (meaning "bone-breaker") by the Spaniards; while mention is also made of it in the Bible as the "ossifrage." The name "bearded," of course, refers to the curious tuft of bristle-like feathers that projects beneath the bird's chin; and that of "lammergeier" means "lamb-vulture."

Although the bird feeds to a certain extent upon carrion, it will also hunt and kill animals on its own account. Its favourite method of attack is to make a sudden downward swoop upon its would-be victim, and in this way frighten or push it over a precipice. It is even stated that the bird will try conclusions with a human being in this manner.

Under the title of griffon vultures are several kinds found in Eastern Europe, the greater part of Africa, and extending to Persia, India, and the Malay Peninsula.

The typical griffon or fulvous vulture stands about three and a half feet in height, while its plumage, although subject to much variation, is mostly of an inconspicuous tawny or yellowish tint; a large white frill or ruff, however, surrounding the throat.

The species known as Kolbe's griffon vulture is called by the Boers the *Aas-vogel*, or "carrion

bird," while it is also spoken of as the "white-crow" on account of its pale-coloured plumage.

But the most handsome of all is Rüppell's griffon vulture, the feathers upon the lower part of the back being brown, and boldly marked with a broad yellowish-grey edging.

Griffon vultures feed chiefly upon carrion, but some of them will also eat locusts, and even small tortoises, the latter being swallowed whole.

They are able to go without food for several days on end without suffering any great inconvenience, but when they do break their fast they make up for lost time by gorging themselves to the utmost. Canon Tristam gives an interesting account of a griffon he obtained as a nestling and brought to England. He writes: "I have seen our pet . . . attack the entrails of a camel, and, as his crop became extended, sink upon his breast, unable to stand, till at length, even this position being too much for him, he lay on his side, still eating, until, overpowered and helpless, he fell asleep. This enormous capacity for food, combined with the power of long abstinence, is a wonderful provision of creative wisdom for carrion-feeders, whose supply is so uncertain, while the necessity for the immediate removal of offensive matter is so urgent. The strength

THE LAMMERGEIER OR BEARDED VULTURE.

See p. 190.

KOLBE'S GRIFFON-VULTURE, CALLED BY THE BOERS THE "AAS-VOGEL," OR "CARRION-BIRD."

See p. 191.

THE PONDICHERRY OR EARED VULTURE.

See p. 193.

THE EGYPTIAN VULTURE OR "PHARAOH'S CHICKEN."

See p. 194.

of the vulture's stomach is equal to its capacity, for on one occasion one of our griffons devoured a half pound of arsenical soap, with no further inconvenience than a violent fit of vomiting."

Most griffon vultures construct a large nest, composed of sticks, upon the rocks; but the Himalayan griffon sometimes appropriates the nest of an eagle, thereby saving itself the trouble of building.

Although vultures have not bred in this country, some Kolbe's griffons have built and laid eggs on several occasions at the London Zoological Gardens. In their native home of South Africa these birds nest during July and August (the winter months in that country), and it is of interest to note that in captivity in England they still nest during that season, selecting the months of January and February.

A very curious type is the Pondicherry or eared-vulture of India, so called because of the pendent and fleshy lappets of bare skin that hang from either side of the head; these, as well as the head itself and the upper part of the neck, being of a cherry-red tint.

It is also known as the king-vulture, or *raj-sogno*, because it forces other vultures to give way to it during a feast; but the true king-vulture, it should be mentioned, is an American bird which, in a like manner to the

Indian species, holds ascendancy over its brethren by reason of its more powerful physique.

The Pondicherry vulture is by no means a common species, and it is rarely that more than a pair are seen together. Its nest, built amidst the branches of a tree, is made entirely of sticks, the interior being lined with smaller twigs.

As the structure is utilized for several seasons, and new material is added every year, it eventually attains to enormous dimensions, one being recorded that weighed 6 cwt.

From the point of view of utility as a scavenger, the Egyptian vulture or "Pharaoh's-chicken" is probably the most efficient of all, for no substance is of too disgusting a nature for it to feed upon. Indeed, it has been described as the foulest-feeding bird that lives.

It is a comparatively small species, only measuring about thirty inches in length, while its plumage is mostly creamy-white in colour, the tips of the wings, however, being black. Sometimes spoken of as the white scavenger vulture, the bird was frequently depicted upon the monuments of the ancient Egyptians. Its nest, which may be built in a tree, on the bare rock, or even on buildings in the outskirts

of towns and villages, is curious in the fact that it is usually lined with rags and other soft materials.

Colonel Irby records having found one that contained a pound of tow, and the sleeve of a discarded coat; while another writer states that old slippers, wool, camel's hair and rags were used to form the bed of one of these domiciles.

Mr. Hume also tells us that in certain parts it is the custom of the natives to tear off a strip of their clothing and hang it up on the branches of particular trees where the vultures nest, this, in all probability, being done from semi-religious motives.

Of the New World or American vultures, by far the most imposing is the condor, its outstretched wings measuring nine feet or more from tip to tip. The adult male is an exceptionally attractive-looking bird (for a vulture), its neck being encircled with a full and downy ruff of white feathers, and the top of the head being surmounted with a large, upstanding and fleshy wattle, a feature that is absent in the hen birds.

One of the most interesting and graphic accounts of the condor is given by Darwin. He tells us that "condors may sometimes be seen at a great height, soaring over a certain

spot in the most graceful circles. On some occasions I am sure that they do this only for pleasure, but on others the Chileno countryman tells you that they are watching a dying animal, or a puma devouring its prey. If the condors glide down, and then suddenly all rise together, the Chileno knows that it is the puma which, watching the carcass, has sprung out to drive away the robbers. Besides feeding on carrion, the condors frequently attack young goats and lambs, and the shepherd-dogs are trained, whenever they pass over, to run out and, looking upwards, to bark violently."

Several methods are employed to capture condors, one of which is to lasso them when they are gorged and unable to rise quickly from the ground, while another way is to place a carcass upon the earth, an enclosure of sticks, with an entrance left open at one end, being made around the bait. When the condors have repleted themselves with food, men gallop up on horseback, and the birds are then easily captured as they have not enough room within the enclosure to enable them to run along the ground before rising into the air. A third method is to noose the birds at night when they are roosting amidst the branches of the trees, a task that is not so difficult to accomplish

as one might imagine, owing to the fact that they are very heavy sleepers.

Describing the flight of the condor, the previously mentioned authority states: "Except when rising from the ground, I do not recollect ever having seen one of these birds flap its wings. Near Lima I watched several for nearly half an hour, without once taking off my eyes: they moved in large curves, sweeping in circles, descending and ascending without giving a single flap."

Many sensational tales have been written about condors picking up children with their feet and then flying away with them, but as their hindermost toes are extremely small, and the whole foot has comparatively little grasping power, such an accomplishment is quite beyond their powers to achieve.

Another American species, of more than usual interest because it is now almost extinct, is the Californian vulture. It was never very plentiful in its haunts, and its decimation was brought about by cattle-owners putting down poisoned meat for the purpose of killing animals that preyed upon their flocks.

Mention must also be made of the turkey-vulture, or turkey-buzzard as it is usually called in North America, a species that is more widely distributed than any other New World

vulture, its range extending over the greater part of tropical and temperate America, and into the West Indies.

In some of the villages and towns of the United States they are found in considerable numbers, roaming about the streets and sitting upon the roofs of the houses without fear. Like many other kinds of vultures they are unable to restrain their appetite should the opportunity arise whereby they can gorge themselves, and when feeding upon a large carcass they will continue to eat until, as one writer puts it, "the food runs out of their mouths as they run." Even when thus satiated, should there be any food left over, the birds do not go far away from their dinner, but remain in the vicinity to digest what they have already partaken of, so that they can return to the feast at the earliest possible moment.

Turkey-vultures build their nests in the hollows of trees, in caverns, or upon the ground under the shelter of a bush or rock. The structures are stated to have a most objectionable odour, while, moreover, the adult birds have the unpleasant habit of ejecting the contents of their stomach at any person who molests them.

The black vulture is another familiar species

found in America, being especially plentiful in the United States, where it is known as the carrion-crow; but the most remarkable of all is the American king-vulture, the naked skin of the male bird's head and neck being decorated with various shades of orange, purple, and crimson, while the plumage is mostly of a creamy-fawn colour. Several large and fleshy wattle-like growths or caruncles are present upon the head in front of the eyes, but in the hen bird this curious form of decoration is reduced to a single upstanding wattle situated over the nostrils.

The American king-vulture is by no means plentiful in its haunts. It is stated to be of a nervous and suspicious disposition, and its habit of sitting in the tree-tops where it gets an uninterrupted view over the surrounding country renders it a difficult bird to approach.

Hailing from Africa is a remarkable bird known as the secretary bird. Although commonly called a vulture, it differs in so many respects from the typical forms that it is placed by ornithologists as the sole representative of a distinct family. In external appearance the bird certainly has little in common with the vultures, for its legs are so long as to resemble those of a crane or stork. Its head and neck, moreover, are fully feathered, while a bunch

of long plumes, which arises from the back of the head, and looks as if the bird were holding some quill pens behind its ears, are characteristic features from which it obtains its name.

Frequently attaining to a stature of four feet or more, the secretary bird has for long been famed as a killer of venomous snakes, and owing to the benefits it renders to mankind in this way it receives the protection of special laws enacted on its behalf.

Its diet, however, appears to be a somewhat varied one, for in addition to snakes it will also eat birds, lizards, rats, small tortoises, locusts, grasshoppers and other forms of insect life.

When attacking a poisonous snake such as a cobra, the bird displays a considerable degree of caution, evidently being aware of the formidable nature of the reptile's bite. Facing its prey it awaits a favourable opportunity to commence its onslaught, and when the selected moment arrives it delivers forward and downward blows with its feet upon the reptile's body.

Should the bird fail to kill the snake at the first effort, it quickly springs backwards out of the reach of the infuriated creature, opening its wings and holding them in front of itself to act as a shield. When it has succeeded in dispatching its prey, it wastes no time before

commencing to eat it, the reptile being swallowed whole, tail end first.

Secretary birds will become very tame in captivity, and in Africa the natives frequently keep them as pets and allow them to roam about their houses. A sharp look-out must be kept upon them, however, when there is poultry about, for they will not hesitate to make a meal of the young chickens should the opportunity arise for them to do so.

CHAPTER XIII

NO EYES, AND MULTIPLE EYES

WE are all aware that the young of many different kinds of animals are born blind, but it is not so generally known that some creatures pass the whole of their existence in that state ; their blindness being a normal and not an accidental condition, and accounted for by the fact that they have no external eyes or merely rudimentary vestiges of those organs.

Among the mammals that are unable to see is the long-snouted dolphin or susu, found in the Ganges, Indus and Bramaputra rivers. It occasionally grows to a length of rather more than nine feet, and is curious in the fact that its back fin is rudimentary and merely represented by a low ridge. The front of its head, moreover, rises so abruptly from the base of its long snout as to make the creature look as if it were suffering from water on the brain.

It feeds principally upon fish and prawns, searching for the same by probing amidst the mud with its sensitive beak, the jaws of which

are armed with an array of sharp teeth, numbering about thirty on either side. When adult the sexes may easily be distinguished the one from the other, the female being larger than the male and possessing a longer snout.

Being a mammal and not a fish, the animal has to come to the surface of the water from time to time in order to inflate its lungs with air, the intervals of its respirations being about every half or three-quarters of a minute. Sometimes when thus engaged it will only rise sufficiently to expose its blowhole above water, but often it progresses in the manner of a porpoise, and during cold weather it will become so frisky as to leap right out of the water.

Although one frequently hears the expression "as blind as a bat," it is hardly necessary to state that there is no truth in the epithet. Neither is the mole nor the legless lizard known as the blind-worm afflicted in this manner, in spite of popular belief. It is true there is a species of mole called the blind-mole (*Talpa cæca*), found in Italy, Dalmatia and Greece, and more rarely in Switzerland and the South of France, but this differs little from the common mole except that its tiny eyes are covered with a membraneous skin pierced with a minute hole which naturally renders the creature's

vision very defective and inferior to that of the common mole.

In some of the mole-rats the eyes are of a rudimentary nature, one species called the strand-mole (*Bathyergus*) having such minute ones that they are no larger than the head of a pin; while the great mole-rat is even worse off for those organs are entirely covered with skin.

In spite of their name, the mole-rats are not related to the moles, the latter belonging to the insectivorous order while the former are rodents. In external appearance, however, they are very like moles—the large head which joins the body without any appreciable neck; the soft, short and thick fur that has the curious property of lying flat and unruffled no matter in which direction it be brushed; and the short limbs furnished with powerful claws, all being mole-like characteristics.

Their habits also resemble those of the mole, inasmuch as they dwell underground, excavate long tunnels, and throw up mounds of earth during their progress beneath the soil; but unlike the former creature they do not feed upon worms, but upon roots and bulbs.

The great mole-rat is found in South-East Europe, Lower Egypt, Syria, Persia, and Mesopotamia. Its subterranean tunnels are stated to be of a very elaborate nature, some of the

galleries extending for a distance of as much as one hundred and twenty feet, and terminating in enlarged sleeping-chambers, or storehouses for the reception of their food.

Found in the subterranean waters in the Kentucky caves is a fish (*Amblyopsis spelæa*) that is entirely blind and has no external traces of eyes. It is quite a small species, rarely exceeding five inches in length, and its ventral fins are rudimentary, or may even be absent. Its skin is of a pale and colourless tint, that upon the head being naked, and that upon the body being covered with minute scales.

Unlike the majority of fish, in which the young are hatched from eggs laid by the females, it is one of the few species that bring forth living fry.

As it is necessary for the fish to eat in order to live, the reader may very well inquire how can it capture its food if it is unable to see it?

But Nature has provided for its needs by endowing it with a very acute sense of hearing and, more important still, a series of very sensitive organs of touch, consisting of numerous ridges or wrinkles situated on either side of the head, that enable it to find its way about in the dark.

The fish obtains most of its food near the surface of the water—few living creatures

inhabiting the depths of the subterranean streams—the capture of its prey being rendered more easy owing to its mouth being directed upwards in such a manner that, when the fish makes a bite, it has not to poise itself so obliquely beneath its prey as other surface-feeding fish have to do. Its head, moreover, is very flat at the top, thereby enabling the creature to swim quite near to the surface, ready to snap up anything that may come within its reach.

In one respect, however, its surface-feeding habits are detrimental to its welfare, for the fish is quite easy to catch with a net or even in one's hand, although complete silence must be kept, otherwise it will promptly dive down to the depths and disappear from view.

Other fish that share with the foregoing the inability to see are the blind soles, of which there are two different kinds. In both the eyes are rudimentary, and the pectoral or breast fins are absent.

Also inhabiting the waters of underground caves is a curious batrachian called the olm or proteus. Found in Dalmatia, Carinthia and Carniola, the creature grows to a length of about eighteen inches, and possesses a long, slender and snake-like body which terminates in a vertically-flattened tail. The tiny limbs

are furnished with miniature toes, those upon the fore-feet being three in number, while only two are present upon the hind limbs. The skin is quite smooth and normally of a pale flesh tint, but if the creature be kept in captivity and be exposed to light for some time, the skin ultimately assumes a slightly mottled appearance due to a dark-coloured pigment that is present in the body rising to the surface. A number of grooves or indentations are present upon the sides of the body, and a bunch of feather-like and bright red gills or branchiæ arises from either side of the head; while to add to its peculiarities its eyes are entirely concealed beneath the skin and only revealed externally by minute dots.

The proteus possesses both gills and lungs, and is therefore able to make use of a double means of respiration. As a rule, however, the animal spends its time in the depths of the subterranean waters and extracts the oxygen held therein with the aid of its gills, but occasionally it will rise to the surface and inflate its lungs with air taken direct from the atmosphere.

It is also curious in the fact that the female sometimes brings forth its young in a living and active condition, while at other times she lays eggs from which the larvæ hatch out.

The temperature of its surroundings appears largely to govern the habits of the creatures in this respect, those that dwell in comparatively warm waters being viviparous, and those that live in colder situations oviparous.

Although the proteus thrives fairly well in captivity, it is of a very sluggish disposition and invariably hides itself in the darkest part of its aquarium. The creatures have been bred in captivity, the first time on record being in the year 1888, when a female produced seventy-six eggs which hatched out after a period of three months. The young, apart from their inferior size, differ little in outward appearance from the adults, except that their rudimentary eyes are somewhat larger and more sensitive to light, and the hind legs little more than excrescences.

The proteus has lately received a considerable degree of notoriety in the daily press owing to the experiments carried out by Professor J. S. Huxley, Fellow of New College, Oxford, in conjunction with Professor Kendall, of America, who utilized the thyroid gland of the creature for administering to mentally defective children with a view to effecting a cure.

Why the animal should have been named "proteus" is difficult to account for, the Proteus of Greek mythology being a sea-god

THE CONDOR VULTURE, THAT HAS A WING-SPREAD OF NINE FEET.

See p. 195.

THE OLM, OR PROTEUS, THAT IS QUITE BLIND.

See p. 206.

THE TUATERA LIZARD, THAT ONCE POSSESSED THREE EYES.

See p. 213.

THE CAPE HUNTING-DOG, AN EXPERT HUNTER.

See p. 219.

which was supposed to have the faculty of assuming different shapes, and the power to foretell future events. He appears to have been very chary in exercising his gifts of prophecy, however, for we are told that only those who had sufficient courage to seize and hold him while he underwent his transformations in form could manage to make him speak.

In addition to those creatures we have already mentioned, there are several kinds of reptiles that are unable to see.

The curious legless lizards, known as amphisbænas, with one exception, have their eyes hidden underneath their skin.

Worm-like in form as well as in habits, these reptiles dwell underground, excavating long and narrow tunnels in the earth, and feeding chiefly upon worms. Some of them, however, take up their abode in the nests of saüba ants, and prey upon their hosts as well as upon their eggs.

On the rare occasions when the lizards come to the surface, they progress by bending their bodies in vertical undulations, thereby differing from other limbless lizards which get along by lateral movement. They are further remarkable in the fact that they can move equally as well in a backward or forward direction when making their way through their subterranean

galleries. Their worm-like bodies are of almost equal thickness throughout their length, and as the head is articulated to the body without any constriction at the neck, the two ends of the creature are very similar.

Taking advantage of this fact, the natives in some parts exhibit the lizard as a two-headed snake.

Of the sixty or seventy different species of these lizards, only one of them has any limbs. Known as the handed-amphisbæna, this reptile, which grows to a length of about seven inches, is found in California and Mexico. Its worm-like body is of a pinkish-brown tint, and a pair of absurdly small fore-legs is situated quite close to the head.

Of the more typical forms, the spotted or sooty amphisbæna may be taken as an example. Receiving its name from the irregular-shaped and black markings upon its body, the creature will attain to a length of eighteen inches when fully grown.

It is found in Tropical America and the West Indies, the natives of those parts calling it the "mother of the saübas" owing to its curious habit of dwelling in the nests of those ants.

Other burrowing and sightless reptiles are the blind-snakes, of which there are two distinct families, namely the *Typhlopidæ* and the

Glauconidæ. The members of these families can be distinguished the one from the other by the arrangement of their teeth which, in the case of the former, are restricted to the upper jaw, and in the latter to the lower one.

Their eyes are extremely small, and almost, if not quite, hidden beneath the scales of the head. All of them are worm-like creatures of small size, and in distribution are to be found in the warm regions of the world. They spend the greater part of their time underground, only coming above the surface after rain. Their food consists chiefly of worms, although millipedes, ants and the larvæ of various insects also form a part of their diet.

Of the lower types of animals that are blind we have familiar examples in the earth-worms. The majority of the bivalves, that include such well-known forms as the cockles, the mussels and the oysters, are also unable to see, although a few of them, on the other hand, such as the thorny-oysters (*Spondylidæ*), and the scallop-shells or *pectens*, are provided with a number of eyes that are arranged in rows along the margin of their mantles.

The thorny-oysters, found attached to the branches of growing coral, are further curious in the fact that when they attain to a certain age their shell ceases to grow externally but

increases in thickness internally, fresh layers of shell being formed, each of which is separated from the others by a water-filled space.

The scallop or pecten—the latter term being a Latin name meaning a "comb," and referring to the flat and fan-shaped form of its shell—is of a bright red or orange colour. One species, found in the Mediterranean, has been given the name of "St. James's shell" because its shell was worn as a badge by pilgrims to the Holy Land.

Although some of the bivalves possess more than the usual complement of eyes, possibly the most remarkable of the multiple-eyed creatures are the double-eyes, four-eyed fish, or anableps of South America.

They grow to a length of about a foot, have very broad heads, and inhabit the waters of the mud-flats. Each of their eyes is divided into two portions by a dark-coloured transverse band, the upper part being adapted for vision above the level of the water, and the lower part for seeing beneath that element.

This double form of vision is rendered possible by the specialized structure of the lens of the eye, the top portion being what is termed lenticular—that is to say, in the form of a double convex lens—while the lower section is spherical.

It appears that these fish feed chiefly upon insect life that skims over the water, and when searching for these the anableps swims along with the upper part of its eyes exposed above the surface, and the lower part beneath.

The females, which are viviparous and larger than the males, carry their young in a bag-like structure or pouch formed of thin skin, and in this retreat the fry remain until they are old enough to look after themselves.

One of the blennies also possesses a similar type of eye to that of the foregoing.

Mention must be made of the remarkable tuatera lizard of New Zealand which, although now a normally two-eyed creature, was believed in past ages to have possessed a third one situated upon the top of its head.

Traces of this extra eye can be found in the reptile at the present day, a rudimentary structure, known as a pineal or cyclopean eye, reposing at the base of the brain.

Although this organ, which is visible through the somewhat transparent skin of the young animal, is now quite useless, it is regarded as representing what was once a functional eye in the reptile's ancestors.

The tuatera grows to a length of about twenty inches, and is of an olive or greyish tint, speckled with a few yellow dots. During

the daytime it hides in holes that it excavates in the ground, the subterranean domain frequently being shared by one or more petrels.

Mr. E. G. Boulenger tells us that "the chambers measure about two feet in length, one foot in width, and six inches in depth, the entrance being only four inches in diameter. The creature always lies in such a position that its head faces the entrance to the chamber, ready to defend its home from intruders, biting and making use of its claws for that purpose."

Although at one time quite plentiful, the tuatera is now getting rare, its distribution being confined to the smaller islands of the Bay of Plenty. Its extermination in many of its former haunts was largely due to the onslaught of pigs and rats, while the greed of collectors and zoological dealers was another factor responsible for the reduction in its numbers.

The previously quoted authority records the interesting fact that "whereas twenty-five years ago a living specimen could be purchased . . . for twenty to thirty shillings, at the present time about fifteen pounds represents its market value."

The lizard thrives well in captivity, the solitary individual at the London Zoological Gardens at the time of writing having been

there for ten years. In a wild state the reptile feeds upon worms, slugs, small lizards, and frogs, but those the writer has known in a captive state were very partial to a diet of dead mice.

A very specialized type of eye is possessed by the arthropods or invertebrate creatures with jointed legs, such as the spiders, crustaceans and various forms of insects. Known as compound-eyes, these organs consist externally of a number of facets, each of which produces a separate image.

It must not be assumed, however, that animals with compound eyes have a keener sight or greater field of vision than those without, for it is generally believed that the former type of eye is adapted more for the purpose of detecting movement than for the reception of actual images.

Whether it is possible for an animal actually to visualize more than one image at a time is a question that the writer does not profess to be able to answer, yet in the chameleon we have a creature that can move each eye independently of the other, so that the one may be looking below and the other above, or one in a forward and another in a backward direction. Such being the case, it would not be unreasonable to expect that the eyes are capable of receiving

two separate images at the same time, but how the brain of the animal is able to differentiate between those objects that are reflected before it and those that are behind, is certainly a difficult matter to explain. Then, again, the question at once arises as to whether the animal can focus simultaneously a near object with one eye, and a more distant object with the other ?

CHAPTER XIV

ANIMAL AVOCATIONS

IF we inquire into the habits of wild creatures, we shall find that they are often directed towards the display of some special gift, the animals following a more or less specified vocation or calling, much in the manner that the majority of human beings concentrate upon some stated occupation.

The work of carpenters, aeronauts, undertakers, trappers, scavengers, and tailors are but a few of the tasks performed by the various members of the Animal Kingdom, and although their accomplishments in such respect may be of a very crude nature in comparison with those of mankind, yet the results achieved are often very remarkable.

The most obvious animal vocation is that of a hunter, an occupation that is developed to a high degree in many of the carnivorous beasts, more especially among the various members of the dog and cat family.

Just as human beings employ different

methods when hunting, so do wild creatures make use of various means for the purpose of outwitting and overpowering their prey; some relying upon their fleetness of foot to enable them to overtake their quarry; others combining and hunting in packs; while others resort to the practice of lying in ambush and waiting patiently for their victims to approach.

Of those that course or run down their prey the cheetah or hunting-leopard is, without doubt, the most proficient; its pace being so great for a short distance that no other living creature can outstrip it. It is not endowed with much endurance, however, and if it fails to overtake its quarry within a few minutes after commencing the chase the beast retires from the fray in disgust.

But very different from that of the foregoing is the method employed by some of the wild dogs, many of which hunt in packs. Wolves, for instance, although usually found in small family parties, will frequently congregate together and hunt in large numbers, especially during the winter months when food is scarce.

When pressed by hunger they become both bold and ferocious, and many stories have been related of the creatures chasing the drivers of sledges over the snow-covered ground for mile after mile. So great is their perse-

verance that even if some members of the pack are shot dead the rest do not give up the chase, a few of the animals merely stopping behind to devour the carcases of their defunct brethren.

Even more ferocious than the wolves are the Indian wild dogs, red dogs, or dholes as they are variously called. Notwithstanding that they are very inferior in size and strength to the former, they are greatly feared by all other wild beasts, even such formidable creatures as bears, tigers, boars, and the enormous wild ox known as the gaur holding them in dread.

Dholes associate in parties numbering from six to as many as thirty individuals. They hunt both by night and day, following their prey with such tenacity that its doom is merely a matter of time. Should the need arise they will keep up the chase for days on end; and when the quarry is at last brought to bay they rush in and overwhelm it by sheer force of numbers, although not infrequently suffering from their boldness.

They are of a wandering disposition, a habit largely due to the fact that when once their presence is made manifest in a district all other creatures flee terror-stricken to other parts.

Another expert in the chase is the Cape hunting-dog, a long-legged and lean beast with

a yellowish coat mottled with irregular-shaped black blotches. It is a swifter and more powerful animal than the dhole, and even the lion is said to fear it. These dogs also hunt in packs, so many as sixty individuals sometimes being seen together. They display much sagacity in their mode of attack, taking it in turns to bear the brunt of the chase, those that are tired falling to the rear, while others, who have been reserving their strength, spurt forward to take their place. In this manner they are able to overcome and wear out the swiftest and most powerful antelope.

Many birds display much ability as hunters, the various members of the hawk family being especially gifted in this occupation. Merlins, the smallest of our birds of prey, frequently course their quarry, such as larks and swallows, in relays, one of them taking up the chase while another hovers aloft ready to relieve its companion should it become tired.

Passing to the vocation of a soldier, we find it exemplified in various ways by different creatures, drilling or moving in formation being one of the phases of military routine that has its counterpart in the lives of certain wild animals.

Wild ducks and geese fly along in a V-shaped formation during their migratory journeys,

while porpoises plough their way through the sea in a more or less compact body, following a leader.

A very amusing story about the latter is related by the captain of a ship. One day when his vessel was passing a shoal of porpoises, and noticing that his passengers were very interested in watching the creatures' manœuvres, he thought he would improve the occasion by telling the onlookers that he could control their movements with the aid of his voice alone. In order to convince his doubting audience that he could accomplish what he had undertaken to do, he sent for a megaphone and proceeded with his task of drilling the porpoises. Shouting through the instrument, he commanded the creatures to turn to the right, and almost immediately they complied with his request, and in a like manner they also turned to the left when ordered to do so. This performance was continued for some time with unfailing success, and so astonished and interested were the onlookers that they failed to notice that when an order was given for the animals to turn one way the boat was steered in the opposite direction, the porpoises merely continuing in a straight line all the time.

The larvæ of the procession moth, when

on their night expeditions in search of food, are other creatures that progress in regular formation.

A single individual heads the way, and behind it march two others side by side. In the rear of these three more caterpillars take up their position, and behind these again are further rows, each successive one comprising one more individual than the row in front; the entire colony forming a wedge-shaped company. Arriving at their feeding ground, they ascend the trunks of oak trees in order to feed upon the leaves, and when they have satisfied their appetite they return to their hiding-places in the same marching order as before.

The artilleryman is represented in the Animal World by the bombardier beetle (*Brachinus crepitans*), a small species found in certain localities of the Southern and South-Eastern coasts of England, being especially abundant in chalky districts. When irritated the beetle ejects an evil-smelling fluid at its foes, the liquid having the curious property of vaporizing upon contact with the atmosphere and assuming the form of a cloud of smoke, while the discharge is accomplished by a slight sound. Other beetles are also endowed with the power to secrete and eject an acrid fluid as a means

of defence, and in one kind found in tropical Africa, Asia, and parts of Australia, the explosion accompanying its discharge is stated to produce a distinct sensation of heat and the vapour to smell like nitric acid.

Should any of it come into contact with one's hand it causes the skin to turn dark brown, the effects not wearing off for about eighteen days.

The old-time archer is represented by the archer-fish or beaked chaetodon found in the fresh waters of North Australia, New Zealand, and the East Indies. It feeds principally upon insects for which it makes diligent search by swimming along the banks of streams or beneath trees whose leaves overhang the water.

Having espied an insect the fish proceeds to capture its prey by shooting out a drop of water from its mouth, its aim being so true that it rarely fails to reach its mark and to bring the insect tumbling down into the water, when it is at once gobbled up.

The fish will shoot with accuracy for a distance up to six feet, and when one bears in mind the small size of the target it will be realized that the creature is a marksman of no mean ability.

From observations made of these fish kept

in captivity, it appears that they do not thrust their mouths above water when shooting at an object, but rest in an oblique position with the tip of the mouth held just below the surface. They also have the curious habit of swimming backwards as well as forwards, the Russian naturalist Zolotnitsky stating that he has often seen them progress in the former direction for several minutes on end.

But for the soldier-like qualities of courage and the readiness to give fight in offence and defence, we have in the warrior-ants (*Formica sanguinea*) and the Amazon ants (*Formica rufescens*) examples that not only form themselves into veritable armies and give battle to rival colonies, but also take up the vocation of slave-dealers, raiding the nests of other ants and carrying off the pupæ to their own homes, where they are hatched, reared and brought up to work and fight for their captors.

The warrior-ants are larger than the Amazon ants, and are said to exhibit more intelligence when indulging in their slave-capturing expeditions, for, unlike the latter which make a headlong rush upon their victims, they lay siege to and surround the nest they intend to rob. It sometimes happens that a colony of warrior-ants meets a rival party of Amazons, with the result that a pitched battle often

ensues, heads and legs being nipped off by the powerful jaws of the combatants.

In West Africa is found a species of ant known as the driving or visiting ant. It congregates in vast armies, and when on the march attacks every living creature that comes across its path. Some idea of the formidable nature of these ants may be gained by the following story recorded by an eye-witness of a struggle between a swarm of driver ants and a venomous cerastes or horned-viper. The reptile, while in the act of shedding its skin, had been set upon by a horde of ants which were hanging on with their sharp pincers to every part of its body. The snake writhed about in a vain endeavour to free itself from its enemies, but after about a quarter of an hour its strength gave out, and it lay upon the ground stretched out at full length. In a few minutes, states the writer, "its body was covered two inches deep with ants tearing and cutting away its flesh."

Should the driver ants happen to pass through a native village during their peregrinations, the inhabitants are forced to beat a hasty retreat and leave their dwellings until the horde has passed by. But as the creatures also drive away at the same time the swarm of rats, mice, beetles, lizards, and other objection-

able animals that lurk within the buildings, their visitations prove to be a benefit in disguise.

Ants have their gentler as well as their sterner forms of occupation, for some of them take up the vocation of dairymaids or milkmaids. Their "cows" are plant-lice, aphides or green-fly as they are variously called, and the "milk" they yield is a colourless and sweet-tasting liquid or "honey-dew" that the insects exude from their bodies. The "milking" process is conducted in a very curious manner, the ants encouraging the "cows" to expel drops of honey-dew by gently stroking them upon the body with their antennæ. Sometimes the ants keep the aphides as prisoners, housing them in special dormitories or "stables" that are excavated out of the branches of trees. Narrow tunnels lead to these "stables," of just sufficient width to allow the ants to pass through, but not large enough to accommodate the greater bulk of the aphides' bodies.

To turn to quite a different type of occupation, we find that the gentle art of thieving is indulged in by quite a number of creatures. Indeed, the majority of them are not above helping themselves to the goods of their fellows, more especially if the same be in the nature of food.

Some of them, however, may be said to be

professional thieves inasmuch as they live to a large extent upon the proceeds of their ill-gotten gains, and of these the great frigate-bird is the most notorious offender in such respect.

Known also as the Son-of-the-sun, or the Man-of-war bird, it is found in the warm regions of the Atlantic, Pacific and Indian Oceans, spending the greater part of its time in the air, and often journeying a great distance from land.

Its food consists almost entirely of fish, which it obtains by forcing other sea-birds, such as terns and gulls, to disgorge as they fly homewards from their fishing expeditions, the victims being so terrified by the attack of the robber that they eject a portion of their partly digested supper as a toll and means of escape.

The frigate-bird then promptly swoops down upon the falling spoil, and catches it in mid-air.

The skuas, near allies to the gulls, are other birds that indulge in a practice similar to the foregoing, but they are also very partial to a diet of eggs, a liking that is also shared by the jay and the magpie.

Then, again, the caracara hawk (*Polyborus cheriway*) of the Southern States of North America often helps itself to the fish captured by pelicans; the thief, although of diminutive proportions in comparison with the former,

pouncing upon a victim as it returns to land with its pouch full of fish.

Under the name of butcher birds are several members of the shrike family that have the somewhat unpleasant habit of impaling the carcases of their prey upon thorns (just as a human butcher would hang a joint of meat on a hook), in which situation they remain until the captors feel inclined to make a meal of them.

Two species, namely the great grey-shrike and the red-backed shrike, are visitors to the British Isles.

The former, which is about the size of a thrush and possesses black and white plumage, is known in some parts of England as the "murdering-pie," while in Germany it is called "nuentedteo" (nine-killer) owing to the belief that it always hangs up nine carcases in its larder before it commences to feed. Another name given to it in the latter country is that of "suffocating angel," but the reason for such a title is by no means clear, although it has been suggested by one writer that it is due to the fact that "the wickedness of the bird's ways has rendered it fit for comparison with the original fallen angel in his suffocating and sulphuric domain."

The great grey-shrike feeds chiefly upon

birds and mammals, but the smaller red-backed shrike usually confines itself to an insectivorous diet, although at times it will capture larger prey, such as mice, frogs and lizards.

One would hardly expect the vocation of an undertaker to have its counterpart in animal life, but in the burying or sexton beetles, several species of which are found in England, we have examples that resort to the practice of interring the carcases of any dead creatures that are not too large for them to deal with conveniently. They are extremely industrious workers, and it is recorded that four individuals, kept under observation in captivity, buried no less than four frogs, three small birds, two fish, a mole, two grasshoppers, and several fragments of other creatures, within the course of fifty days.

When the beetles discover a dead bird, or a dead rat, they glide beneath it and commence to excavate a hole in the earth with the aid of their legs, the loose soil being thrown to one side as they proceed with their work. Gradually the carcase sinks into the pit thus made, until at last it rests below the level of the ground, when the diggers complete their task by throwing back the loose soil upon the dead body.

The reason why the beetles undertake this laborious work is in order that the females

may deposit their eggs in the buried carcase, the ova being hidden from the eyes of prying enemies, and the young being assured of a supply of food when they hatch out.

Another beetle (*Dytiscus marginalis*) is an expert diver. It is found chiefly in stagnant waters, and swims with the aid of its strong hind legs which act as a pair of oars. Like other living creatures it requires a supply of air in order that it may breathe, and as it is unable to extract the oxygen held in the water in the manner that fish do through the agency of gills, it overcomes the difficulty by taking down a supply of air with it, making periodic journeys to the surface of the water for this purpose, and thrusting its tail into the atmosphere. The air then enters the beetle's spiracles or breathing holes, from whence it is conducted all over the body through a number of small tubes, while a further supply is also carried between the closely-fitting wing-covers and the back of the body.

A diving-beetle has been known to remain under-water for nearly twenty minutes on end, but as a rule they come to the surface for a fresh supply of air at intervals of about eight or nine minutes. They are strong flyers, an accomplishment that is necessary to enable them to reach a new habitation should the

pond wherein they are dwelling dry up during the summer months.

Even more remarkable are the habits of the water-spider (*Argyroneta aquatica*), a species found in ditches and ponds in the British Isles and other parts of Europe. It spends the greater part of its time under-water, even pursuing its prey beneath that element. When swimming its appearance is extremely beautiful, the hairs upon its body carrying and retaining minute bubbles of air that shine like silver.

The spider spins a bell-shaped nest among the waterweeds for a habitation, the opening of the webbed structure being at the bottom. When this is completed, it commences to fill the chamber with air, frequently coming to the surface of the water and carrying down a bubble of air which is liberated beneath the entrance of the nest and rises to the top of the structure. As this work proceeds, the fairy-like domicile gradually gets inflated with air and acts as a diving-bell, so that the spider can dwell inside for a considerable period before the supply is exhausted.

Expert divers are also to be found among mammals and birds; the seal, the sea-lion and the walrus being the most noteworthy of the former, while of the latter the penguins, cor-

morants and darters are especially gifted in such respect.

The nest-building habits of birds portray quite a number of different vocations, those of the tailor, the builder and the artist all being represented. The bower birds, for instance, in addition to building nests for the reception of their eggs, also construct bowers or play-grounds; the feathered folk often displaying their artistic temperament by decorating the latter with flowers or bright objects such as shells or the brilliantly-coloured wing covers of beetles. The baya weaver-bird, according to native reports, will even fix fire-flies to its nest with the aid of mud for the purpose of lighting up its domicile at night, but the veracity of this statement is, to say the least, open to doubt.

The weaver-birds are represented by a large number of species. Many of them build flask-shaped nests with a tubular entrance depending from the main structure; but the sociable weaver-birds, which congregate together in large numbers, make enormous communal nests in the shape of an open umbrella, the upper part of the structure being almost solid, while the lower and flat under-surface is honeycombed with small cavities that are the entrances to the individual nests.

The tailor-bird displays even more ingenuity than the weaver-birds, for it builds its nest within the space formed by fixing the edges of several leaves together. In the accomplishment of this task the bird first of all prepares a thread by twisting together such material as vegetable fibres, the silk from cocoons, thread, wool, and cobwebs, after which it proceeds to pierce a row of holes with its beak along the edges of the leaves it desires to sew together. The thread is then passed backwards and forwards through the holes in the manner of a boot being laced up, the edges of the leaves being drawn together and forming a hollow cone. After this work is completed the bird builds a cup-shaped nest inside composed of fine vegetable fibres, horsehair and slender grass stems.

It is not always, however, that the tailor-bird actually sews the leaves together, for occasionally it will attach them to the nest itself and leave the edges of the leaves free. Mr. Hume, in his description of the nests of these birds, states: "I have found them between two leaves, the one forming a high back, and turned up at the end to support the bottom of the nest, the other hiding the nest in front, and hanging down well below it, the tip only of the first leaf being sewn to the middle of the second. I have found them with

four leaves sewn together to form a cavity and sides, from which the bottom of the nest depended bare; and I have found them between two long leaves, whose sides, from the very tips to near the peduncles, were closely and neatly sewn together."

The tailoring trade also has its representative in the leaf-cutting bees which may be said to imitate the work of the "cutter-out." The insects bite out circular and lozenge-shaped pieces of leaves with the aid of their strong jaws, and carry away the material to their nests to make thimble-shaped cells wherein the eggs are laid; the actual nests being narrow tunnels excavated out of decaying wood or in underground burrows, although at other times they may be constructed in the crevices of walls.

Leaf-cutting bees belong to a group known as solitary bees, inasmuch as they do not associate in communities. Seven different kinds are to be found in the British Isles, one of them being a frequenter of London suburban gardens as rose-growers are well aware. Although no definite quantity of leaf fragments is used in the making of a cell, yet from observations that have been made it appears that the average number employed is eleven, seven of which are lozenge-shaped, and four circular. How the

bee manages to cut the portion of leaves to the required shape and size is a matter for wonder, and although no great degree of mathematical precision is required or can be expected in the accomplishment of this task, yet there can be little doubt that the insect has at least some idea as to what is necessary, and "cuts its cloth" accordingly.

The leaves generally used in the construction of the cells are those of the rose, the poplar, the privet, the hornbeam and the poppy.

In addition to its qualification as a tailor or cutter-out, the bee also follows the vocation of a cook, for it makes a sort of pudding by collecting pollen and nectar from flowers, and almost fills the cells with the mixture. It must be mentioned, however, that only the females are workers, the males leading a frivolous life unattended with parental cares.

Within each cell a single egg is laid, and the entrance is then sealed up with circular pieces of leaves. After an interval of a few days the grubs hatch out and commence to feed upon the dainty fare that has been provided for their needs.

When they have eaten up all their food they spin a cocoon of silk around themselves, and lie dormant throughout the winter months; but at the end of the following spring the larvæ

turn into the pupa state, and a few weeks later assume the winged form and become perfect bees.

To mention yet another occupation, namely that of angling, we find that several members of the Animal Kingdom are exponents of the art; one, known as the angler-fish, the sea-devil, the fishing-frog or the frog-fish, being found in British waters. Although occasionally growing to a length of five feet, it usually only measures about a yard.

Of a sluggish disposition, and but an indifferent swimmer, the British angler-fish spends the greater part of its time resting upon or crawling along the ocean bed. Its fins are especially adapted for walking purposes, and are also utilized for scratching or stirring up the sand in order to arouse the curiosity of its prey and to conceal its own presence. But its chief lure is a long tentacle that arises from its head and terminates in a bifurcated and pendent growth that might easily be mistaken for a worm in the dim light beneath the water. By keeping this lure constantly on the move, the angler attracts other fish to their doom, the victims being snapped up as soon as they come within reach of its enormous mouth.

The appetite of the angler appears to be enormous, for it is recorded that no less than

twenty-one flounders and a John Dory were taken from the stomach of a captured individual. Even sea-birds sometimes fall victims to its appetite, and we are told that on one occasion one of these fish was discovered in the act of endeavouring to swallow a seagull; while even such indigestible items as iron grapnels and the cork floats of crab-pots have been known to be swallowed by this marine gourmand.

Although the vocation of an aeronaut is a comparatively new one in regard to the human race, yet among animals the art of flying has for long been an established occupation. The majority of birds and insects are, of course, adepts in the accomplishment of aerial evolutions, but some of the fish, as well as a few of the mammals and reptiles, are also endowed with the power to fly.

Of the mammalian aeronauts the bats are the only ones that are able to lift their bodies up into the air by their own physical efforts, the digits of their fore-limbs being very elongated, and supporting a thin membrane of skin which serves to beat the air in the manner of the wings of a bird.

Other so-called flying mammals, such as the flying-phalangers and the flying-squirrels, merely glide through the air for brief periods by means of stretching tight flaps of skin that

extend from the front to the hind limbs and are attached to the sides of the body. These act like a parachute and offer sufficient resistance to the air to prevent the animals from falling straight to the ground when they launch themselves from the branches of trees; while the distance covered during their aerial journeys depends upon the height from which they commence their downward flight.

In a way similar to the foregoing, the flying geckos also receive support from membranous flaps of skin; while a certain snake from Borneo is said to be able to glide through the air by holding itself straight out and depressing the underpart of its body so that it presents a concave surface to the atmosphere as the reptile drops obliquely from a high elevation to a lower one.

In the case of the flying-fish, however, it is not definitely proved whether their large wing-like fins act only as gliders, or whether they are employed for beating the air when the creatures are in flight, some writers being of the opinion that they hold their wings motionless when thus engaged, while others favour the alternative theory.

Some of the spiders undertake aerial journeys by means of spinning long threads of such a fine texture that, wafted by the breeze, they

float upwards into the air and carry the little creatures with them. Darwin gives a very interesting account of some of these spiders, the author stating: "A spider . . . while standing on the summit of a post, darted forth four or five threads from its spinners. These, glittering in the sunshine, might be compared to diverging rays of light; they were not, however, straight, but in undulations like films of silk blown by the wind. They were more than a yard in length and diverged in ascending directions from the orifices. The spider then suddenly let go its hold of the post and was quickly borne out of sight."

We have already dealt at some length with the occupation of a scavenger in our chapter upon vultures, but there are other members of the feathered folk, such as the carrion-crow and the adjutant stork, that also ply this useful vocation to the benefit of mankind.

Special mention must also be made of the hyenas and jackals which are partial to a diet of carrion.

Then we have the signallers, as exemplified by the glow-worms and the fire-flies, to which further reference will be found in these pages; while the policeman is represented in animal life by the king vultures, the king snake and the king cobra, all of which exercise their

authority over their fellows with such success that they are invariably treated with the greatest respect. It is true that fear is chiefly responsible for producing such a submissive frame of mind on the part of the subjects towards their overlords, and in the case of the king snake and king cobra discretion certainly proves to be the better part of valour, for if other snakes, be they venomous or otherwise, get in their way, they are promptly eaten up alive.

Athletes and acrobats are to be met with in many forms of animal life, the monkeys, and especially the arboreal apes known as gibbons, displaying the most wonderful agility in their movements. Kangaroos and jerboas are endowed with remarkable powers of jumping, while in the lower members of the animal creation we have examples in the locusts, grasshoppers, crickets, frog-hoppers and fleas which far outstrip the efforts of the greatest human athlete in their leaping powers.

The flea is able to leap two hundred times its own length, and it has been computed that if a man six feet in height were able to achieve a similar performance he could leap from Bow Church in Cheapside right over the top of St. Paul's Cathedral and land at the bottom of Ludgate Hill. The frog-hopper,

however, is even a greater expert than the flea, for it is stated to be able to jump for a distance exceeding two hundred and fifty times its own length.

The rôle of schoolmaster is played by many animals in the tuition of their young, the parents frequently employing very drastic methods when instructing their progeny.

The razor-bill, for instance, teaches its chicks to dive and swim under-water by holding them by the scruff of their necks and ducking them; while wild ducks that nest in hollows of trees, or some other similar situation above ground, push their babies overboard when they consider them to be sufficiently developed to begin to look after themselves.

Birds also have to be taught to fly just as human beings have to be taught to walk, the parents inducing their offspring to make use of their wings by first of all encouraging them to hop from one branch to another near by, and then gradually increasing the distance so that it is necessary for them to employ their wings during the passage.

The hawks and eagles train their young to become expert at flying by dropping a dead pigeon or mouse from the nest and then urging them to follow and catch the food in mid-air; while the swallows and fly-catchers follow

a similar plan by making use of a fly or some other insect as a lure.

The carnivorous animals display much patience in teaching their young to hunt and track their prey, and those creatures that depend to a large extent upon their protective coloration to evade the attack of their enemies have to be taught the art of "freezing" or remaining motionless in times of danger.

The duckbill or platypus, one of those remarkable mammals that lay eggs, induces its young to enter the water by ejecting a drop of milk therein; and the baby elephant has to undergo several weeks' tuition before it is able to pick up anything with its trunk.

Possibly the most curious of all animal vocations is that of an agriculturist, an occupation that is followed by a certain species of ant, called the agricultural ant and found in Texas. Its farm, as one may well call it, is situated in the vicinity of its nest; a piece of ground rather more than a square yard in extent being levelled and cleared of all obstacles. Roadways or lanes, kept free from all weeds and herbage, radiate from the main clearing in all directions, the bare paths being about five inches in breadth near the nest and gradually tapering away as they lead to the surrounding fields.

Within the cleared space around the nest the ants cultivate a special kind of plant known as ant-rice, tending it with great care and gathering the seeds when they are ripe.

Whether the ant actually plants its crop in the first instance is a matter concerning which there is a great difference of opinion, some naturalists being of the opinion that it does so, while others are inclined to doubt the statement.

The crop is carefully harvested and carried into the nest, the husks being removed and the seeds stored. Should any of the latter be at all damp, the ants bring them out on a fine day to dry in the sun, thereby preventing them from rotting and from germinating.

The granaries wherein the seeds are stored are a series of chambers connected by numerous galleries, the latter sometimes extending to a depth of over three yards, although the former are never more than about thirty inches below the level of the ground. Curiously enough, notwithstanding that the ants feed upon various kinds of seeds, those of the ant-rice are the only ones they cultivate. When feeding their young the insects cover small portions of seed with their saliva which has the property of converting the starch contained in the food into sugar.

The leaf-cutting ants (*Œcodoma*) are also agriculturists, inasmuch as they cut away portions of leaves which they carry to their nests and form into manure beds for the cultivation of a special kind of fungus, upon which they feed.

These "mushroom" beds are looked after with great care, the temperature of the underground chambers being regulated to a nicety by opening or closing the entrances of the various galleries leading thereto.

Quite a number of animals follow the occupation of a trapper. The ant-lion employs a most ingenious method for catching its prey, forming a cone-shaped pit (measuring two or three inches across at the top) in dry and sandy soil, and then burying itself at the bottom to await the approach of its victims. Should an insect investigate the nature of the pit and take a step over the brink, the loose sand gives way beneath its weight and the creature tumbles headlong to the bottom, right into the ant-lion's jaws. Even if the victim be larger and stronger than the lurking foe the former has little chance of escape, for the more it struggles and endeavours to run up the sloping sides of the pit the more it disturbs and brings down the loose sand upon itself, the ant-lion in the meanwhile throwing the soil out again

as rapidly as possible so as to prevent it filling up the trap and enabling its prey to reach the surface and regain its freedom.

The spiders exhibit remarkable ingenuity in the construction of traps and snares, their beautiful silken structures being familiar to every one. Some of them, however, known as trap-door spiders, of which the British species may be taken as an example, construct tubular tunnels in the ground, wherein they lie in wait for their prey. This tunnel, which is lined with silk, extends below ground for a distance varying in length from nine to fifteen inches and has a diameter of about three-quarters of an inch. The nest is continued for a short distance above ground by a silken tube, strengthened with particles of sand or earth which render the outside of the extension less noticeable than it otherwise would be. This external portion, forming the snare, is attached to the surrounding herbage, and a number of threads are fixed to the inside and lead down to the bottom of the nest.

Reposing within her domicile, the spider fastens the ends of these threads to her person and then awaits the approach of her prey. Should an insect happen to alight on the trap, the information is instantaneously communicated to the spider below by means of the

threads which act as telephone wires. It then creeps stealthily upwards until it reaches the spot where its victim, such as a fly, has alighted, and with a rapid dart drives its fangs right through the silken wall and into the body of the unsuspecting insect outside the snare. The fly is then dragged down to the bottom of the nest for consumption, but before the spider commences its meal it mends the hole made in the tube when pulling its victim through.

Other kinds of trap-door spiders make a different kind of nest, the top of the tubular and underground structure being sealed with a lid that sometimes takes the form of a thin and flat plate overlapping the entrance to the burrow, but more frequently is a thick and perfectly-fitting plug, the edges of which are bevelled and fixed to the wall of the tunnel by silken threads that form a hinge. This type of nest, however, is not in the nature of a snare, but is merely used as a habitation, the spider, which goes forth at night in search of its prey, reposing within its fortress during the daytime and defying the entry of its foes by clinging tightly to the silken lining of the tube and lid.

Brief mention must be made of those creatures that take up the vocations of the

builder and the mason. The birds are, of course, the most familiar of those animals that specialize in building operations, but many mammals, such as the beaver, the squirrel, the harvest mouse, and others too numerous to mention, exhibit wonderful constructive ability in the building of their homes. As, however, our remarks upon animal avocations have already extended to a considerable length, we must reserve to a future occasion a more detailed description of these interesting animals.

In the mason wasp we have a creature that copies the work of the human mason by mixing up fine particles of earth with its own saliva, thereby producing a mortar that forms a hard substance when dry, the same being utilized in the formation of small tubular cells, about an inch in length, that are fixed to various objects such as a pebble, a wall, or the branch of a tree, and wherein the female insect lays her eggs. When the cells are completed the wasp proceeds to provide for the needs of her prospective family by placing small caterpillars inside to serve as food when the grubs hatch out, the caterpillars being rendered inactive, but not being killed, by the wasp, who stings them in such a manner as to paralyse them.

Having done this, she completes her work by closing up the entrance to the cells.

Before ending our remarks we will refer briefly to the doctors or apothecaries of animal life, among which are to be numbered the cats and dogs that are in the habit of eating grass as a medicine. It has even been stated that the mongoose, when bitten by a venomous snake, will search for and eat certain herbs to act as an antidote to the poison, but this story, it should be mentioned, is not based upon fact.

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